MODERN PLASTICS

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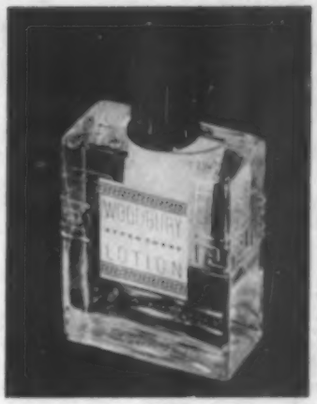

J A N U A R Y

The Technical Section of our January issue will be important to those close observers of developments within the industry because it will contain brief reviews of recent activities in the bread-and-butter plastics, phenolics, ureas, vinyls, alkyds and such. Each subject will be covered by an authority whose research in his particular field qualifies him to write. In the same issue, the mechanism of Industrial Design will be revealed in "The Birth of a Bottle."

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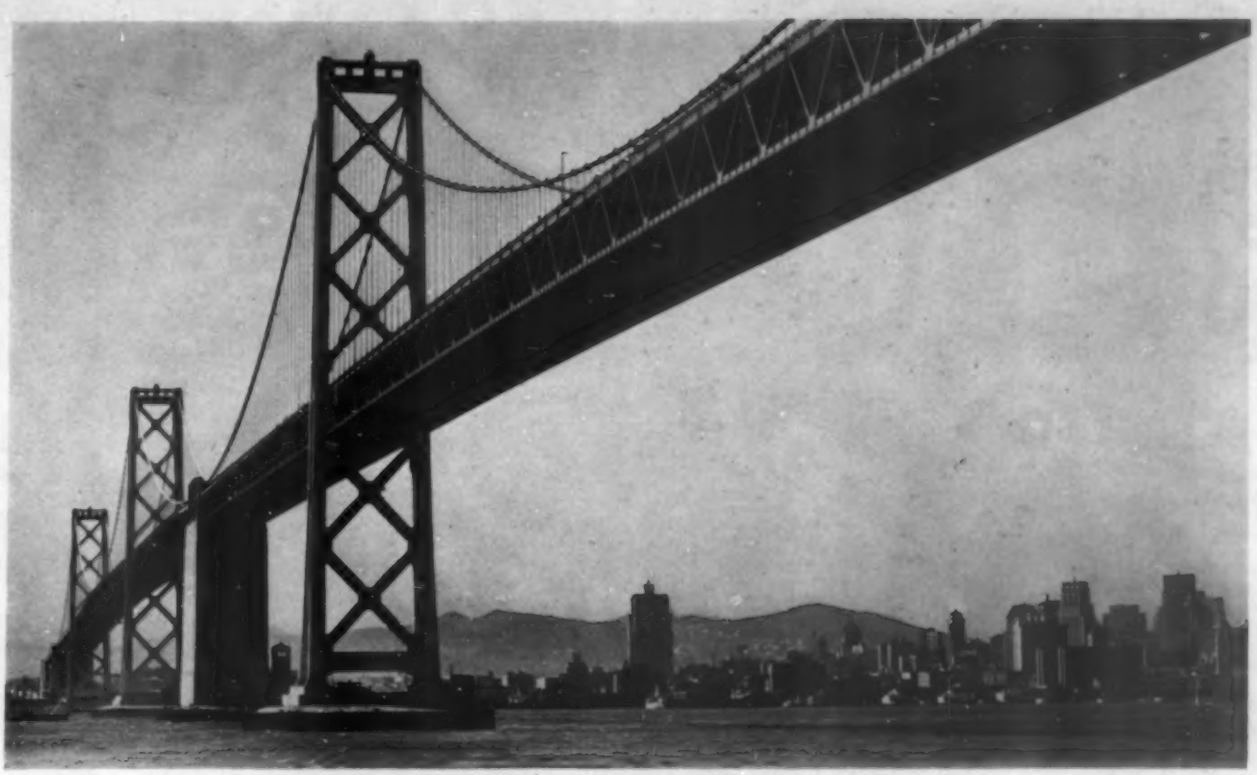


San Francisco–Oakland Bay Bridge, engineering marvel that is capable of carrying 24,000,000 automobiles, 6,000,000 buses and trucks and will be able to carry 50,000,000 railway passengers every year. Safety of the 50,000,000 railway patrons will be guarded by electric relays, protected by cellulose plastics

FIFTY MILLION PASSENGERS CAN'T GO WRONG

Because engineering exactitude has provided safeguards which leave nothing to chance

AMERICA'S NEWEST TRAFFIC marvel, an electric interurban system capable of transporting 17,000 passengers in either of two directions during a 20 minute peak, will go into operation early in 1939 across the $77,200,000 San Francisco–Oakland Bay Bridge. In such a system, representing every modern advancement in rapid transit, it was inevitable that plastics should play an immensely important and successful part.

A battery of 4200 electric relays, capable of controlling the movement of 56 trains an hour each way across the giant bridge during peak periods, is housed in as many molded cases of transparent cellulose acetate. This use of plastics is more than a mere secondary factor in the successful operation of the system, in the opinion of the railway signaling experts who have designed and are installing the new system.

Transparency of the cellulose acetate cases is all-important, as it permits inspection of the relays without removing the covers. Of equal importance, however, is the compactness of the relay panel, made possible only

When the operator of this panel presses buttons, relays set track switches, flash signals of approaching trains and operate controls establishing proper car speed

Possibility of human error will be reduced to a minimum. Signals will be removed from poles along the track and put right into the cab, and if the operator fails to heed a warning, brakes of his train go on automatically

through use of plastics. Experiments have shown that no other material could be molded into the perfect rectangles obtainable with plastics, without extra thickness at the corners. Also, plastics are the only materials that can provide transparent cases with walls only $^{7}/_{64}$ to $^{9}/_{64}$ of an inch in thickness, while still not too fragile for practical use. Such a thickness in the plastic cases, however, produces a covering sturdy enough to support the weight of a man.

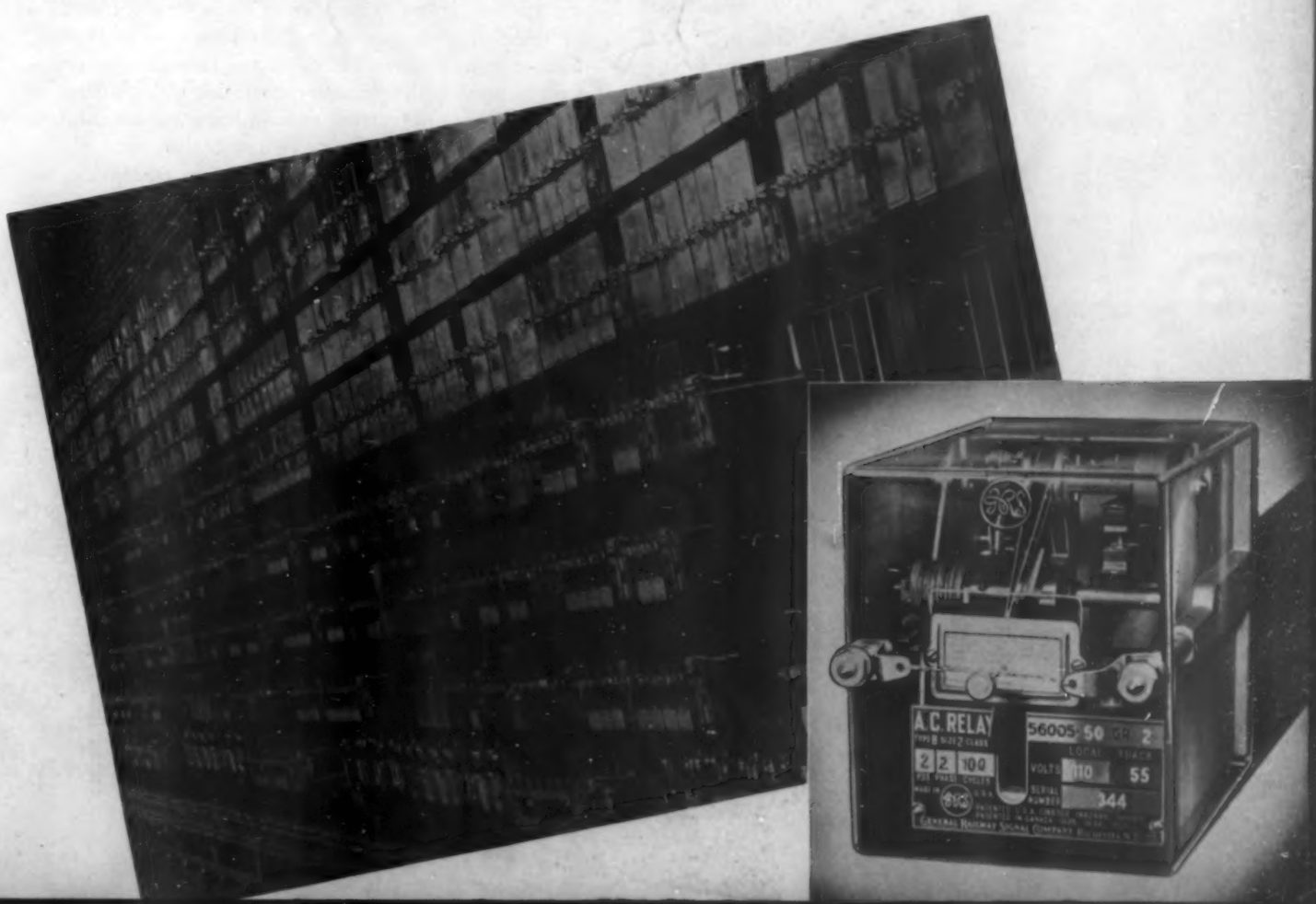
The system of electric controls across the bridge and at the Oakland yards and San Francisco terminal, is designed, built and installed by the General Railway Signal Company. This company also produces the cab signal device, installed in Key System and Sacramento Northern cars, between San Francisco and Oakland, which flashes to the motorman the electrical signals carried through the relays. In addition to the material factors which led the signal engineers to choose cellulose acetate for the relay cover material, there is another important consideration from the viewpoint of the manufacturer. That is the complete control of all manufacturing processes in one plant.

Obviously, it would be impractical for the signal builders to maintain a glass plant to produce covers, yet it is entirely practical to operate a battery of presses to form plastics. That is exactly what is being done by the General Railway Signal Company. Two large presses, one with a single mold and one with a double, are used for making relay covers. Fifteen smaller presses are used for forming plastic materials used in other parts of railway signal construction.

Construction of the single-cavity, large-mold press is identical with the two-cavity press, each having two inlets and two outlets in the lower and upper part of the molds to produce quick and uniform heating and cooling. Presses are 12-inch semi-automatics equipped with 6-way, 3-position control valves and automatic heating regulating instruments for temperature control. Temperature is controlled within at least five degrees over a range of from 150 to 330 degrees. The temperature control instruments are operated by air pressure reduced to 20 pounds per square inch. The presses have a maximum capacity of 140 tons.

Cellulose acetate molding powder is carefully weighed and then preheated for approximately fifteen minutes. The molds are brought up to 330 degrees when loaded and then closed on low pressure of 350 pounds per square inch for approximately six minutes. Then they are closed on high pressure, using 60 tons for the single cavity large mold and 120 tons for (*Please turn to page 70*)

Electric brains of the train control system, 4200 relays housed in "skulls" made of Monsanto cellulose acetate molding powder, will do the thinking for the railway system that crosses San Francisco–Oakland Bay Bridge. Automatically setting switches, operating safety signals and even stopping trains in emergencies, these instruments will permit dispatching of 10-car trains at the rate of 56 an hour. Below, one of the 4200 relays in which cellulose plastics do their part by protecting delicate mechanisms from dampness and dust. Their transparency permits inspection of the working parts without removing the covers. (All photos courtesy Monsanto)



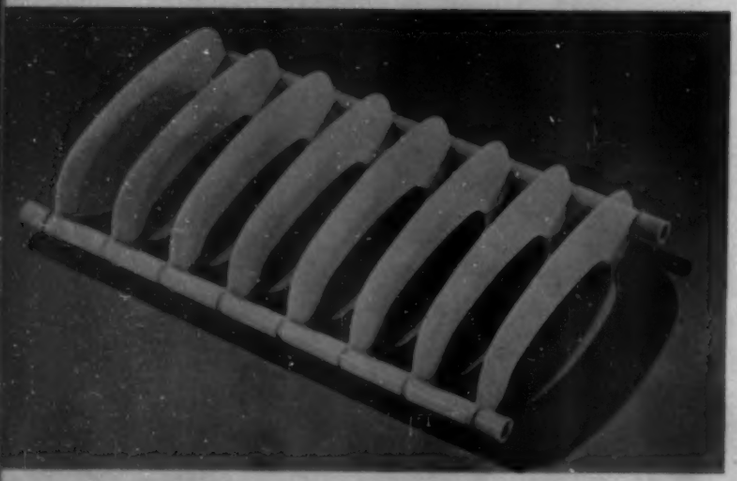
GOOD-BYE TO GLARE

by W. N. SHEPARD
PLASKON CO., INC.

Commuters get a break with diffused lighting on Philadelphia's subway cars

YOU'RE STANDING ON THE PLATform. Here it comes. It stops smoothly and you walk into a pleasant cream and gray interior, set off by bright scarlet stripes. You sit down in a red leather seat, and notice the warm, glareless glow of concealed lighting. It sounds like a club car on the Twentieth Century Limited, but actually it's one of the new cars on Philadelphia's city-owned subway system!

Ever since some observant design-engineer first noticed that lighting was a major part of travel comfort, there has been a revolution in train, bus and trolley lighting. Gone—or going fast—are the bare lamps glaring palely from ceiling sockets, lamps just harsh enough to give you a headache but not bright enough for comfortable reading, and spaced in such a way as to produce shadows and blind spots.



As far as underground transportation is concerned, these new Philadelphia subway cars are among the first to treat lighting as more than a necessary evil. The City Transit Department engineers set up as an objective complete absence of glare, elimination of all shadows and an illumination level of ten foot-candles on the reading level in all parts of the car.

Such specifications obviously called for engineering ingenuity, and the car manufacturers, the Pressed Steel Car Company, called in The Adams & Westlake Company to design a suitable fixture. In order to develop maximum illumination with minimum current, direct lighting was decided upon, which called for some sort of shielding arrangement to reflect and transmit the light output downward and at the same time prevent any direct filament glare.

Turning to translucent plastics the designers found the proper illumination properties in natural white urea—the type of material used for molding lamp reflectors and ceiling bowls. This material, in commercial fixture thicknesses, reflects 75 percent of the light and transmits 13 percent, giving an over-all efficiency of 83 percent. Such a ratio between reflection and transmission promised to provide the necessary scattering of light rays, at the same time permitting enough light to pass through the reflectors to prevent any shadow-formation.

After considerable testing and experimenting an arrangement of vertical plastic vanes or louvres was decided upon. Placed directly under the lighting trough, the vanes were spaced an inch and a half apart and ran the entire length of the car, creating the feeling of a continuous glowing band of light.

Careful planning was also necessary to make the fixture practical from a maintenance standpoint. To make lamp replacement simple and quick the louvres were assembled on foot long metal rods, with hollow molded plastic spacers keeping the louvres firmly in place and covering every inch of the metal rods. This permitted maintenance men to remove (*Please turn to page 70*)

(Above) Readers in any part of the car are bothered by neither glare nor shadows, for the light from the overhead troughs is thoroughly diffused by Plaskon louvres molded by General Electric Co. and Beetle panels laminated by the Richardson Co. (Below) Each foot long section, made of eight molded louvres and molded tubing connectors, is easily removable for lamp replacement

1 2

The crossing flagman (Fig. 1) nattily uniformed in bright colors, automatically waves his flag as miniature trains roll past. His body, housing a solenoid that actuates his cellulose acetate arm, is molded in two halves. The "Limited" roaring out of the tunnel (Fig. 2) is typical of the life likeness of these toy trains

JUST FOR FUN

by L. C. PARKER
THE LIONEL CORPORATION

Eight to ten million dollars are spent annually for toy trains and accessories, of which the Lionel Corporation makes about two-thirds

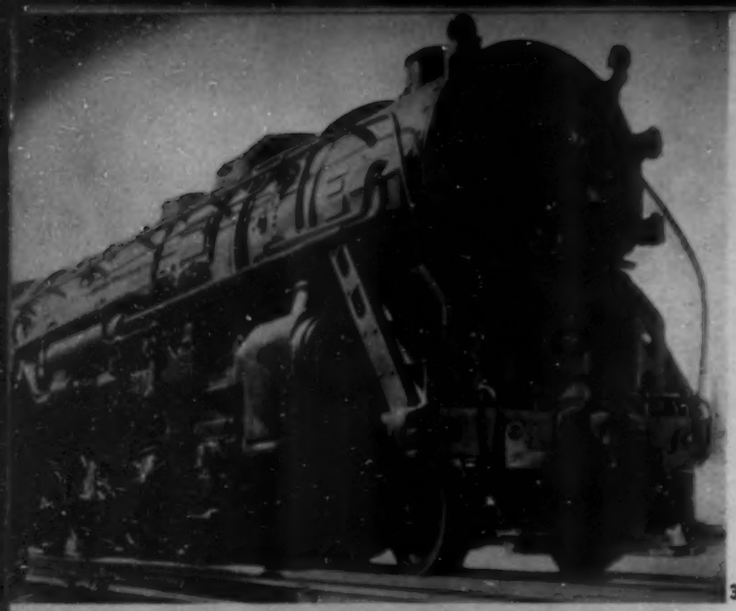
FOR SEVERAL MONTHS PAST YOU may have heard rumors that The Lionel Corporation would have some innovations to offer in this year's miniature electric trains . . . not only in new and more elaborate types of equipment, but that plastics for the first time, were to be used extensively in track and switch assemblies and for various other purposes.

And it is all true! A visit to the Lionel plant today will reveal a compact molding plant, with an even dozen of the latest type presses running at full capacity, three full shifts per day, turning out moldings by the thousands and not able, even at that, to keep ahead of demand. The advantages of plastics are so many that we have loaded work into this new department just as fast as our engineers could design parts and molds could be made, mounted on the presses, and put into service.

Before talking about plastics, however, perhaps a few facts about the business of building railroads in miniature would be interesting. The size of the plant, with its acres of floor space, latest types of metal working and other manufacturing equipment and its modern production and assembly lines, testing departments, woodworking shops, etc., amazes most visitors. Few realize that the manufacture of toy trains and the accessories that go with them is an eight to ten million dollar business. The Lionel Corporation does about two-thirds of this business, employs between 500 to 750 workers all the year 'round and as many as 1000 during peak production periods, three to four months before Christmas.

Molding department

The first Lionel locomotives, made in 1909, were iron castings. Rails were flat wire strips set in wood ties. Batteries were the power source. Today's trains make



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PHOTOS COURTESY LIONEL

use of modern alloys and metals, steel stampings, chromium plating, die castings, synthetic finishes . . . and this year, in increasing volume, plastic moldings. The plastics molding department was established early this year. A few acetate and resinoid moldings had previously been purchased and some still are. The department consists of battery of six 150-ton toggle-type molding presses, manually operated, and a row of six automatic molding machines. Larger parts such as rail switch bases and track mountings are molded in the standard presses. The automatic machines are used for molding lamp brackets, whistle impellers, push-button control housings and various other smaller parts. Presses and automatics were installed one or two at a time and capacity was increased as rapidly as redesign could be completed to substitute moldings for assemblies fabricated by other methods using other materials.

Advantages of molded construction

It was quickly determined that plastics contributed much to good appearance, better insulating qualities, strength and durability of all parts; also that their adoption resulted in actual savings in manufacturing costs in some instances. An excellent example of this is the whistle impeller shown. 125,000 of these were run off on one of the automatic molding machines and the savings effected on this one piece, over former machining methods, were sufficient to pay the entire installed cost of this machine and mold.

It is impossible to make comprehensive cost comparisons because most of the parts molded are entirely new this year; nothing similar was ever made before. On parts such as switches, where comparisons might be made, we have produced, in return for a slightly higher manufacturing cost, vastly improved assemblies, not only from the point of view of appearance and design but also from the operating standpoint. Obviously it has paid to go to plastics moldings for these parts.

5

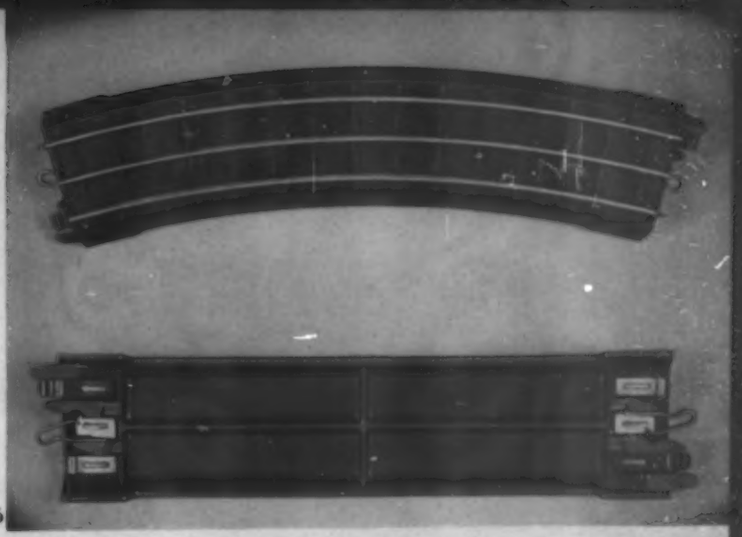
Both the powerful looking steamer (Fig. 3) and the svelte streamliner (Fig. 4) are designed for durability, realism and action. Using molded plastics, the designers were able to obtain these models with greater detail and more rapid production methods. Trains of all types, representing many roads, with accompanying accessories, are included in the train yard shown in Fig. 5

Plastics have made it possible also for us to add new items to our line. The flagman who stands and waves for crossing traffic is a good example. This little figure is molded on the automatic machines. It is made in two halves using two separate dies, one for front and one for the back. Blue phenolic is the material. The moving arm and flag, because of the thin section involved and the strain it must withstand, is an acetate molding. Space is provided inside the figure for a little solenoid which is wired through the hollow legs of the figure to the base. This solenoid actuates the arm as a train passes. Without plastics it would be difficult, indeed, to assemble a unit like this at a reasonable cost.

Another item we are sure will catch on quickly is a new remote control car-dumping and car-uncoupling assembly. A push-button control switch and special track section are arranged to uncouple any desired car and to couple it again without touching the train. This same assembly will also dump a loaded dump car's contents into a coal bin simply by pushing another button. The bin, the track assembly and the control housing are all made of moldings.

Assembly methods

In the molding department parts are tumbled to remove flash, then are taken to the assembly lines. Here flash in holes and slots is punched out by means of cleaning dies. An accompanying photograph, Fig. 13, shows a close-up of one of these cleaning operations. Moldings then proceed along the assembly lines where metal parts are put into place and securely fastened by assembly dies mounted in special presses. Photograph, Fig. 15, shows an assembly die for bending over the 21 pairs of rail fingers that hold the rails to a track section molding. Careful assembly die construction and provision for applying only sufficient pressure for assembly operation, prevents damaging the moldings. Assembly is carried along progressively in the regulation manner and no un-



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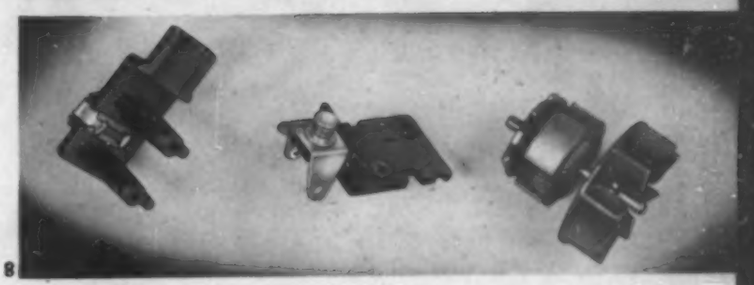

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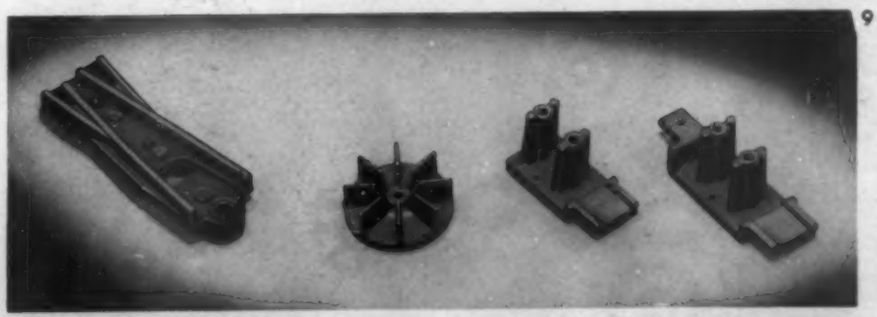

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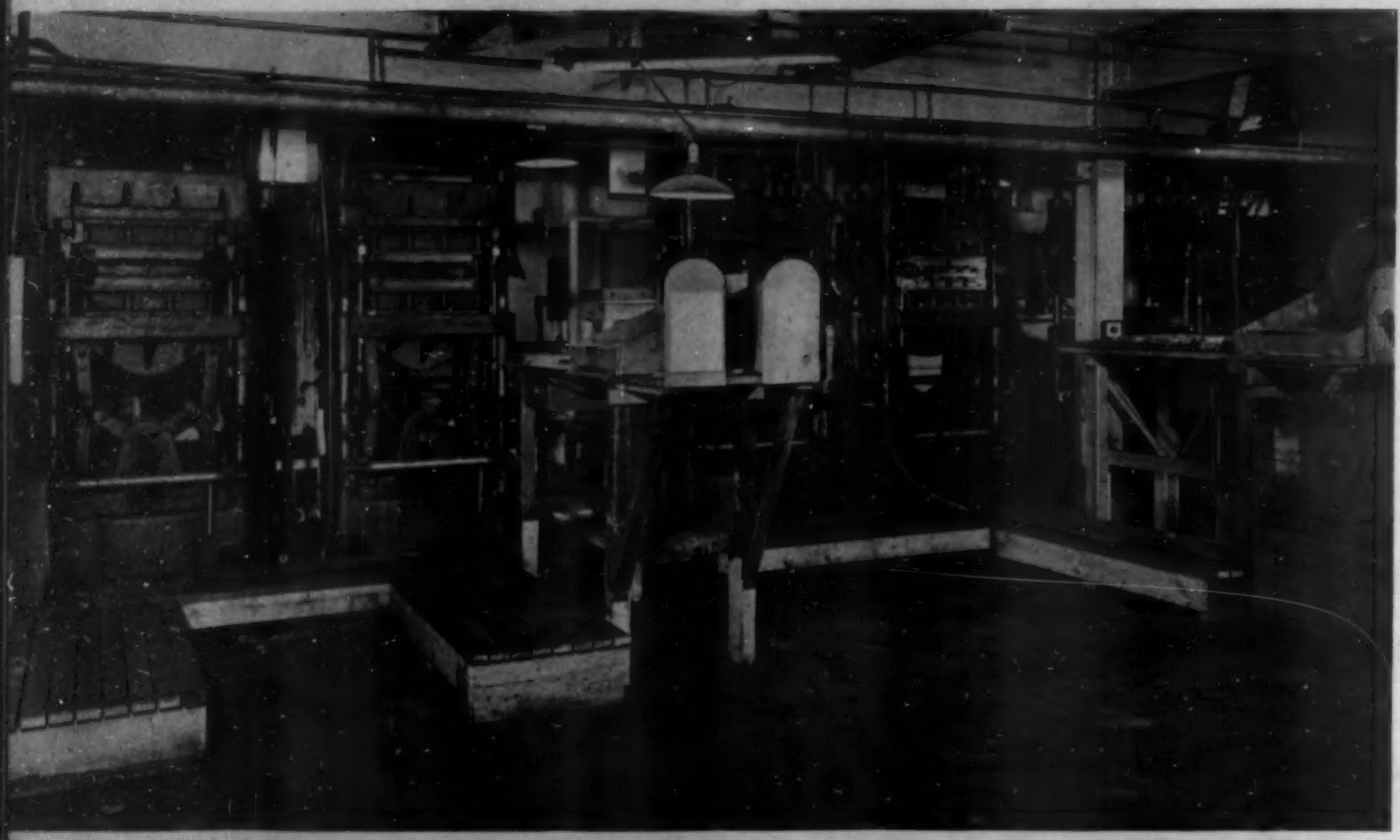
Metal rails and interlocking snap latches (Fig. 6) are anchored firmly to the molding in an assembly die. Many separate parts in the remote control and switch sections (Fig. 7) are eliminated by incorporating intricate details in the mold. Metal and molded parts are combined in the rail contact shoe, automatic car coupler and whistle impellor (Fig. 8) to provide strong, permanent assemblies. These parts (Figs. 9, 10) are readily adaptable to automatic molding

Fig. 11. Six 150-ton Standard toggle-type self-contained presses at the Lionel Corporation molding plant. Across the aisle from these are six Stokes automatic molding machines (four are shown in Fig. 12) which run continuously and require only occasional attention from the operators of the Standard presses. Both these installations are in full-time production turning out parts for miniature electric trains



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surmountable difficulties have been encountered in combining various metal and plastic parts into strong and durable assemblies. Company engineers developed a number of ingenious methods and the equipment for these operations. An interesting example is found in the assembly of the whistle impeller mentioned above and shown in Fig. 8. This molded impeller is a force fit, pressed onto its armature shaft, without, however, creating stresses in the molding sufficient to injure it. The secret lies in knurling the shaft at the point where the rotor is attached, the knurling taking care of unequal expansion of metal and plastics molding at various temperatures. Even at the high speeds at which this rotor is turned up we have no breakage.

Molded track sections

The new track sections are excellent examples of how plastics can be used to improve product quality and appearance. In the case of narrow gage track, Fig. 14, the metal rails fit into slots in the molding and rail fingers or pins are turned over on the under-side in an assembly die; making it practically impossible for rails to loosen up or get out of alignment. In the wider gage track the rails are fitted over projections that run the full length of the molded track section, and are similarly secured in place. The use of plastics moldings for tracks has also made it possible to make the ends of the track sections interlocking and to employ an automatic snap-latch which holds the sections together so securely it requires a hard pull to take them apart.

No skilled operators necessary

Some interesting facts about the presses and automatic molding machines were brought out in discussing this equipment with the superintendent of the molding department. These machines were set up under his supervision and he personally establishes time-cycles and methods, changes molds, determines pressures, etc. He has a crew of about fifteen men, only one of whom had had previous molding experience. These men, recruited from the factory, were all capable of taking over their jobs after one day's instructions by the superintendent. This crew operates the six standard molding presses, in three shifts.

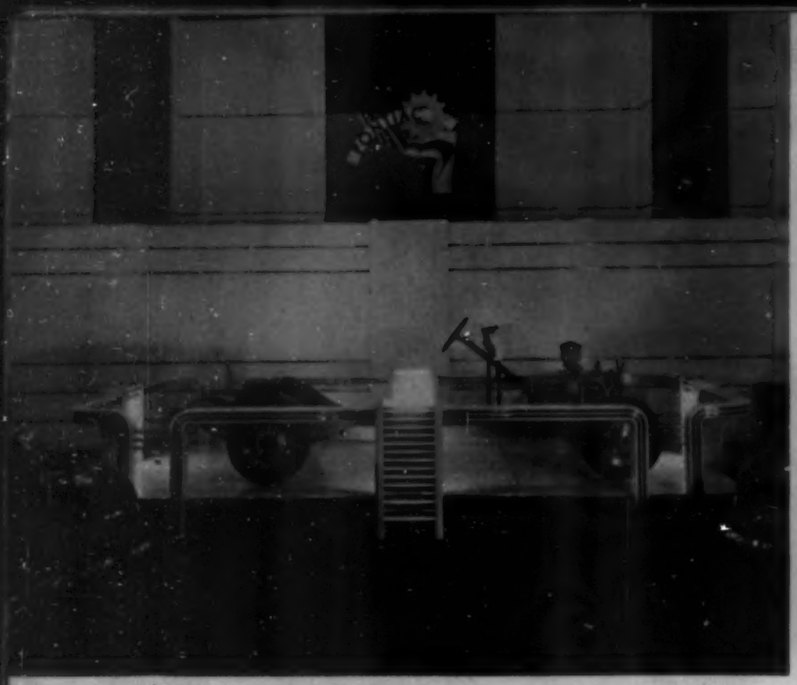
The automatic molding machines require no operating attention. The other press operators are charged with the responsibility of keeping the hoppers of these machines filled. These machines are as completely automatic as any mechanism can be; but, if, as occasionally happens, a molding fails to eject or a machine stops and rings its warning bell for some (*Please turn to page 68*)

13

14

15

Flash from 41 holes and slots on the switch base is cleaned in one operation by a cleaning die (Fig. 13). Fig. 14 Assembling five rails to the base. With this track section cars may be automatically uncoupled, loaded, dumped and recoupled. Large assembly die (Fig. 15) with punch mounted on pressure pad, bends over 21 pairs of rail fingers on the underside of the molded base



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MOTOR SHOW DISPLAY

In which plastics demonstrate the ability of their peculiar characteristics to attract attention

NO ONE KNOWS THE VALUE OF dramatic display better than the manufacturer of motor cars. And certainly, no manufacturer makes better use of this knowledge. Motor Shows in metropolitan areas are among the most glamorous occasions of the year when hundreds of thousands of motorists and wish-they-were-motorists turn out *en masse* to leave finger prints on the glossy surfaces and delicate upholstery of the new models; wind windows up and down; and bang doors to their hearts content. Salesmen answer pertinent and impertinent questions and try to arrange demonstrations if the prospect looks as though he had the down payment.

Action seems to be the keynote of display. Gorgeous cars spin dizzily on platforms that revolve. Others flip-flop in carefully timed rhythm to permit a lecturer to describe and elaborate upon their most intimate details outside and inside. Individual exhibits permit the curious to shift gears, apply brakes, test air-flow, by operating buttons and levers arranged on transparent displays where no real harm can be done.

But always amid splendor and brilliance these Shows build up a festive atmosphere in which will-power is feeble competition. There is more of the theater than of the circus in the modern Motor Show. More of color harmony than of garishness. And this year, more of plastics than ever before.

With no thought of deserting the jaloppy that has carted us back and forth through eighteen states this year, we went along with the crowd to see the New York Show. When the manufacturers have weighed the reactions and have decided just what cars they will continue to make for 1939, we shall tell you something about the plastics they are using, but right now we want to tell you how they are using plastics in display.

Pontiac had five Jewel Cases (that's what they call them) with transparent acrylic louvers about two inches apart on each side, which are edge-lighted from the back with concealed lines of light with startling results. A stripped chassis was displayed in the central case (Fig. 1) while individual innovations were demonstrated in flanking cases, two on each side (Fig. 2).

3

LaSalle was displayed on a brilliantly lighted turntable (Fig. 3), separated from admirers by a luxurious transparent octagonal partition nearly three feet high which was made from sheets of acrylic resin, with a wide curved hand rest at the top. Dodge used the transparent plastic to portray phantom figures of a man and woman in evening clothes about to enter the car on either side. Figures were life size, engraved in line, and edge-lighted by a lamp concealed beneath their bases. You will have to look sharp to see them in Fig. 7, because they were pretty transparent for photography to reproduce.

Chevrolet, also displayed on a revolving platform, was surrounded by two heavy parallel transparent rods edge-lighted from the ends where they were inserted in metal supports (Fig. 4). Since amber lighting was used it was impossible to determine whether the rails were acrylic or phenolic and those in attendance didn't know. Whatever the plastic, the effect was enticing and the rods, which were nearly two inches in diameter, were ample in size to prevent a stampede, yet contributed their protection with a friendly glow.

Plymouth models were displayed against a setting of two shades of opaque gray topped by translucent bands of orange and ivory cast resin, lighted from behind (Fig. 5). This decorative arrangement framed the display from other exhibits and provided a perfect foil for the gay colors of the models shown. An acetate steering wheel with gear shift demonstration was provided against the wall for those who wanted to play.

Buick used transparent acrylic resin for its display of radio control. A thick sheet, on which letters appeared, covered the top half of the display, while colored lights flashed from within to drive home the points of a convincing innovation. Recessed displays of Buick's Crown Clutch Spring and Transmission were explained by cast resin letters cemented to strips of the same material in contrasting colors.

Undoubtedly there were many other important uses of plastics in these displays but we couldn't wait any longer to get home to look over the catalogs we had picked up—and besides, did you ever have a corn

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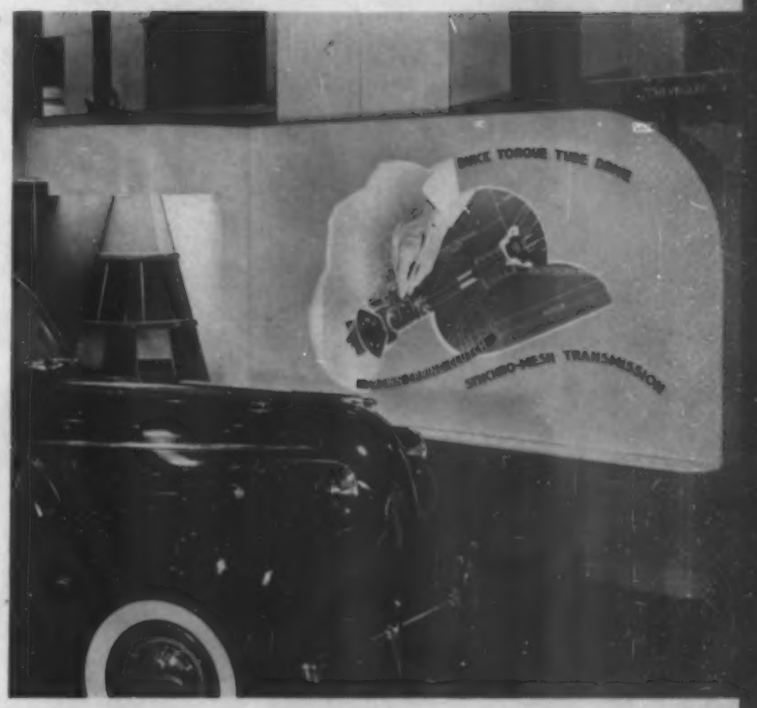

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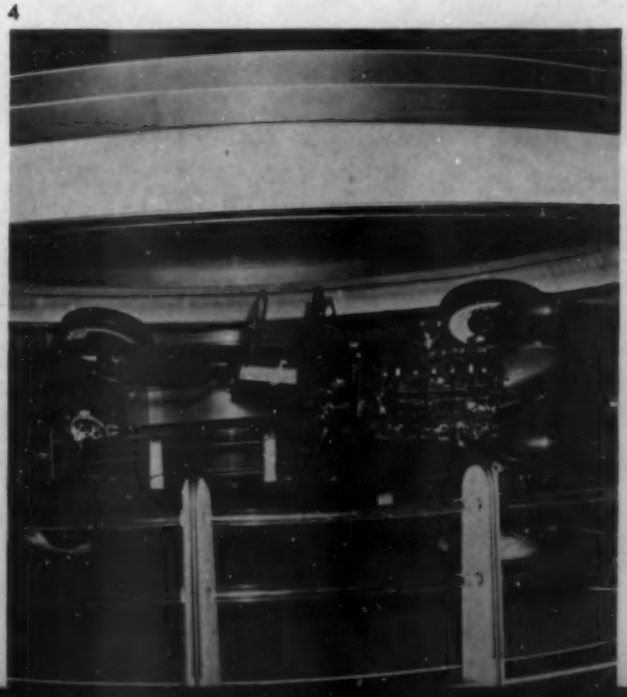

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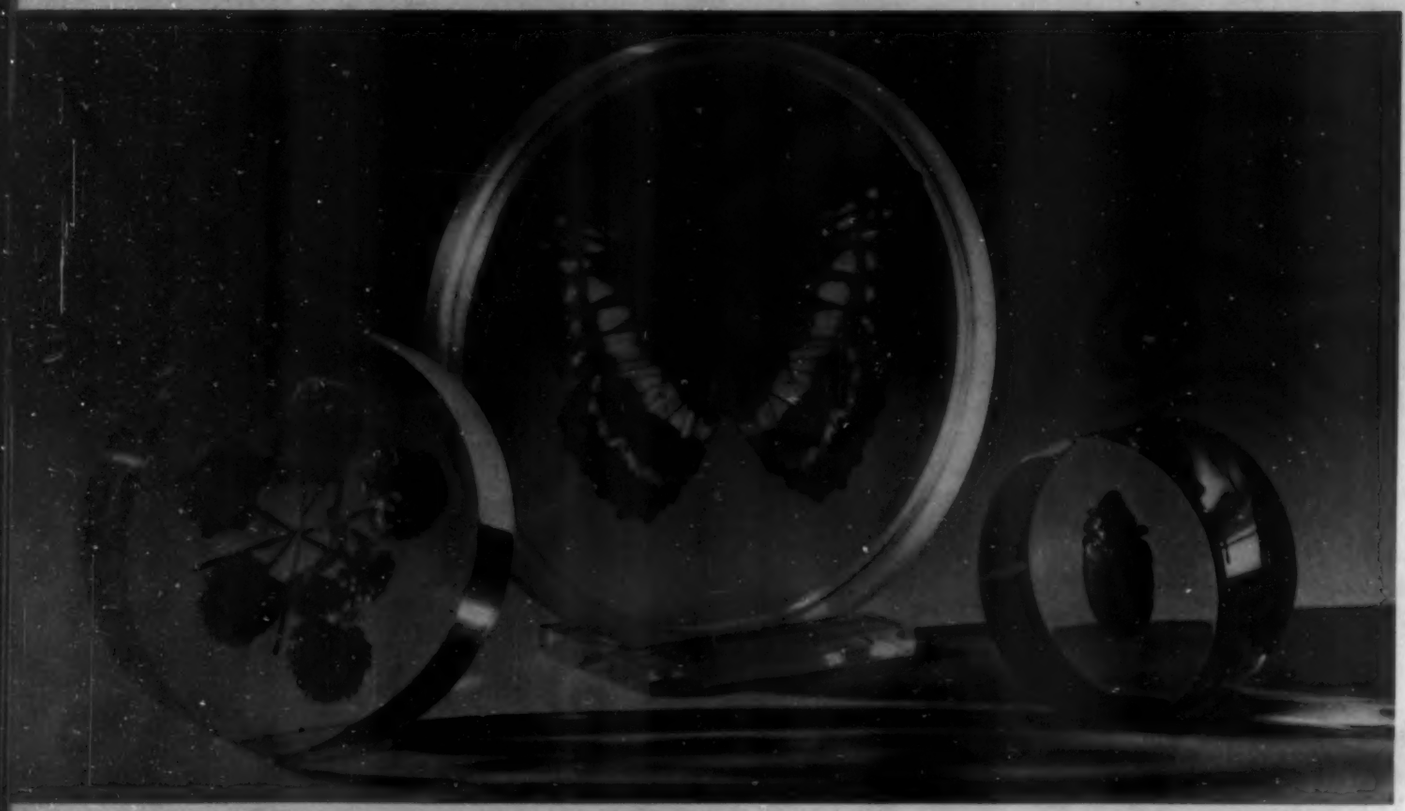
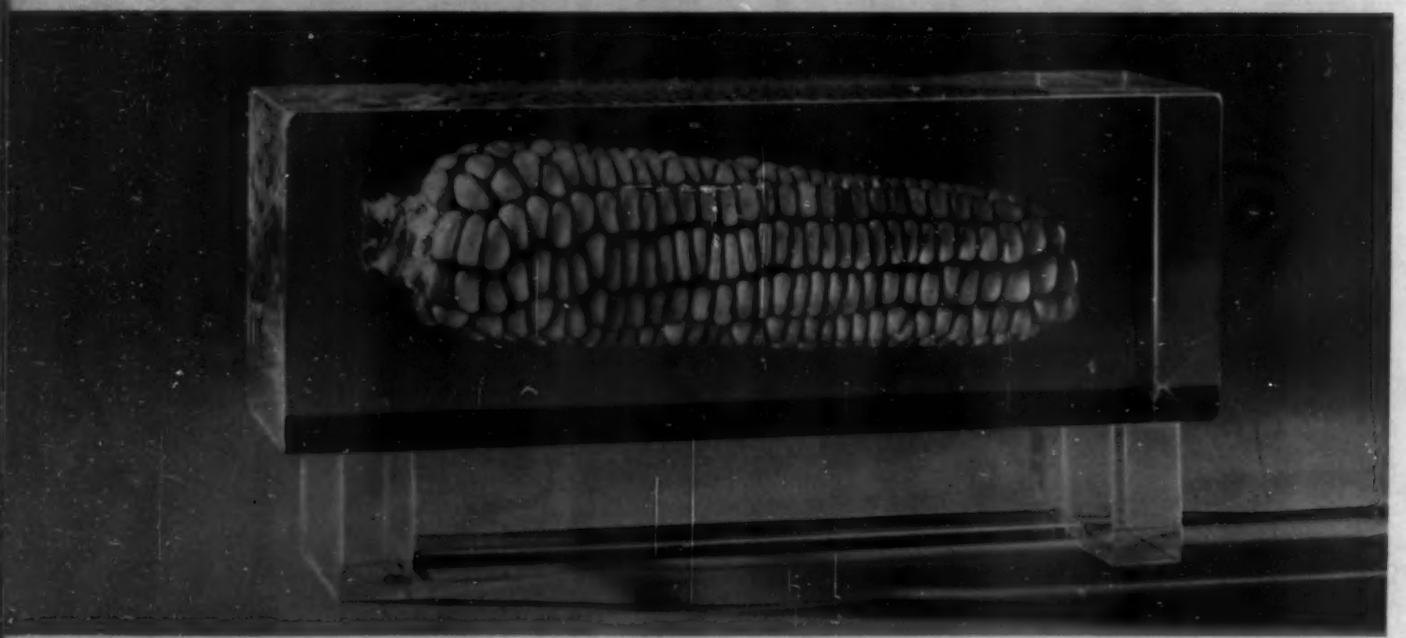
BOTANY AND BIOLOGY





With custom-built finishing equipment, and a special methacrylate resin developed by Röhm & Haas Co., Inc., Dr. Chas. E. Sando of the Bureau of Chemistry and Soils (U. S. Dept. of Agriculture) embeds these botanical and biological specimens for preservation, retaining the intrinsic beauty of their natural colors. The sprig of wheat on the opposite page is one of the longest in existence

ALTHOUGH THE CRYSTAL-clear transparency and permanent properties of the acrylic plastics have been used to advantage in many applications of these materials, Dr. Charles E. Sando, Bureau of Chemistry and Soils, U. S. Department of Agriculture, has employed these qualities for an unusual purpose in preparing these exhibits of agricultural and biological specimens. Dr. Henry G. Knight, Chief of the Bureau of Chemistry and Soils, published a preliminary paper on this interesting development in *Science*, October 8, 1937.

In the past, biological and botanical specimens have been preserved by pressing and drying, or by immersing in liquids. The first of these methods presents two disadvantages, the loss of natural color, and the fragility of the specimens; the second method permits the natural color to be preserved for only a limited period, and the containers are bulky and fragile. The method developed by Dr. Sando, of embedding specimens in a transparent plastic, makes it possible to keep specimens indefinitely with complete preservation of their natural shapes, sizes, and colors. The mounted specimens may be viewed from any angle, are relatively light in weight, and due to their permanence, should be very useful as records of healthy and abnormal specimens for scientific research, for educational purposes, and for exhibition.

Specimens to be mounted must be dehydrated, as moisture will cause cloudy spots in the finished mount. The dehydration is accomplished either by drying in air or by using dehydrating agents such as alcohol, xylol and ether, or dioxan. The monomeric methacrylic esters which polymerize to give hard colorless transparent solids are used as mounting mediums. The liquid monomer is polymerized to a sirup by adding a catalyst and heating, and the specimen immersed in the sirup in a mold. Entrapped air can be removed by placing the immersed specimen in a tight container and evacuating. The polymerization is then completed with carefully controlled heating, this step sometimes taking many days. When the polymerization is complete, the plastic is removed from the mold. The polymer is then given a special treatment to prevent subsequent crazing, and the plastic machined to the desired shape. The machined surface is then carefully polished to a high luster. Due to the excellent machining qualities and the brilliance of the acrylic plastics, it is possible to make pleasing and interesting mounts. By machining the mount to the correct curvature, the plastic may be made into a lens so that small specimens are magnified and details accentuated.

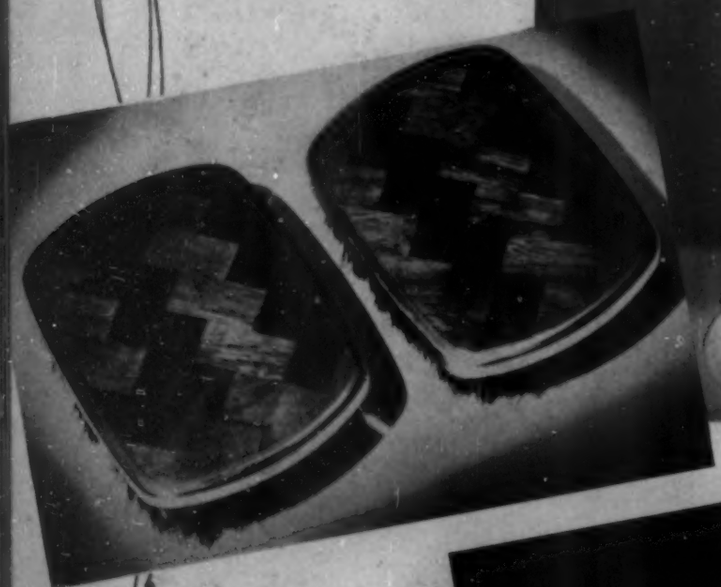
Although the above outlined embedding technique sounds relatively simple, extreme care must be taken with each step, and the beautiful specimens prepared by Dr. Sando are the result of many months of painstaking work. There are several difficulties still to be overcome, but it seems probable that further research will develop methods which may be employed by anyone interested in preserving biological and botanical specimens for any purpose.

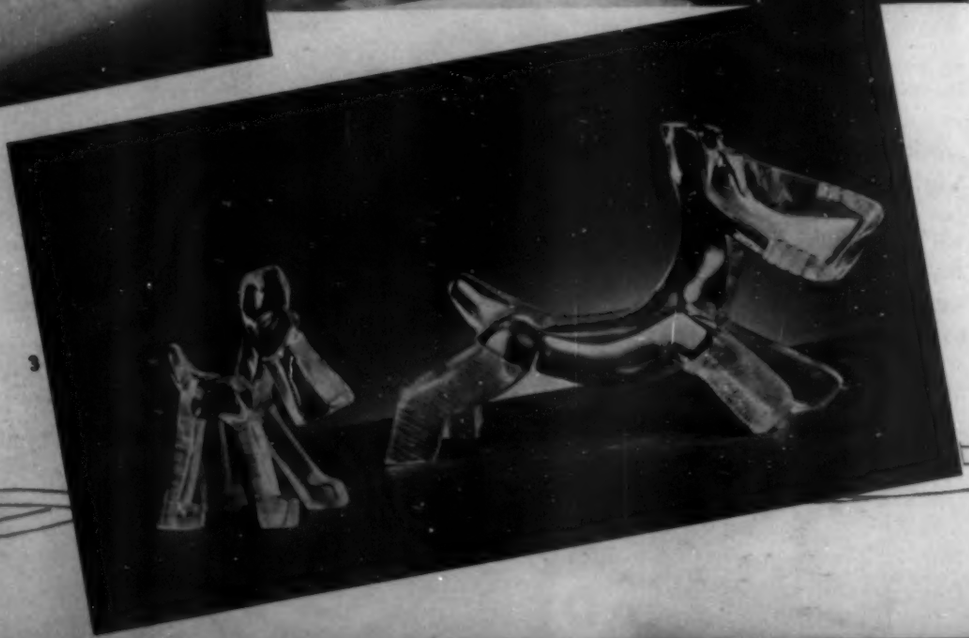
AND THE SAME TO YOU

by EVE MAIN

COURTESY HARPER'S BAZAAR

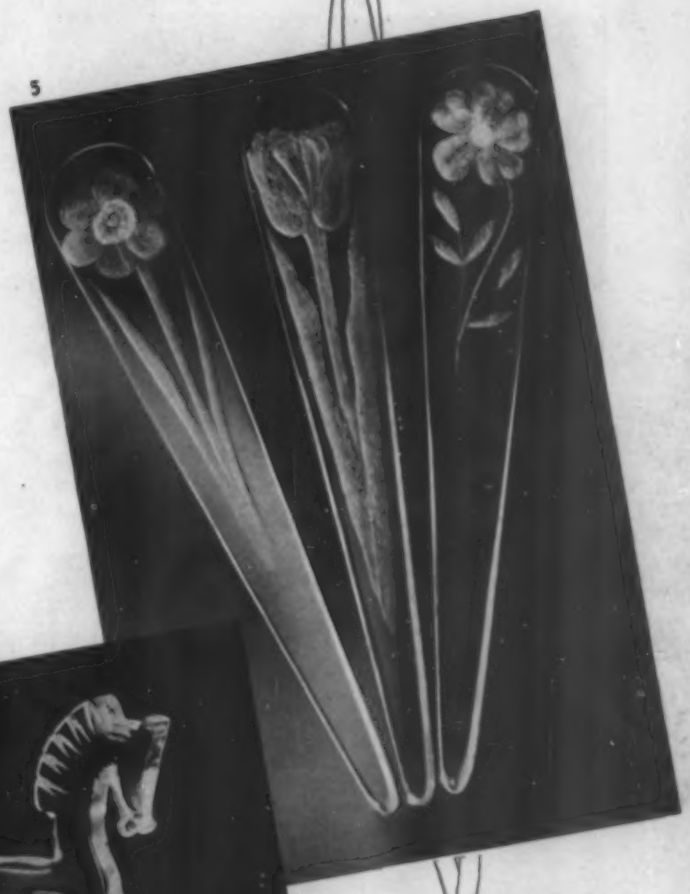
1

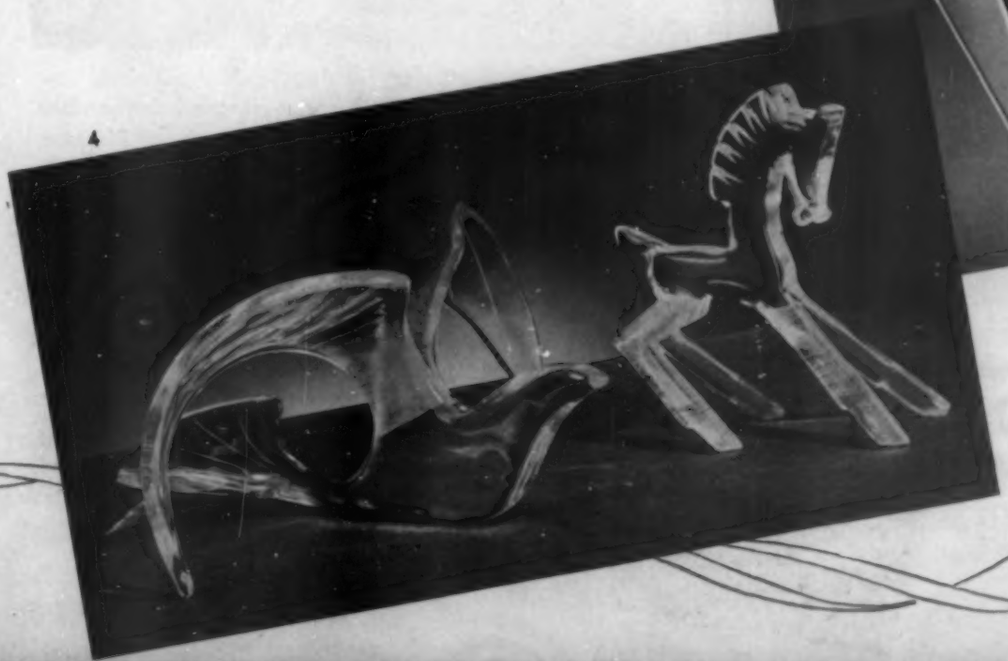




3

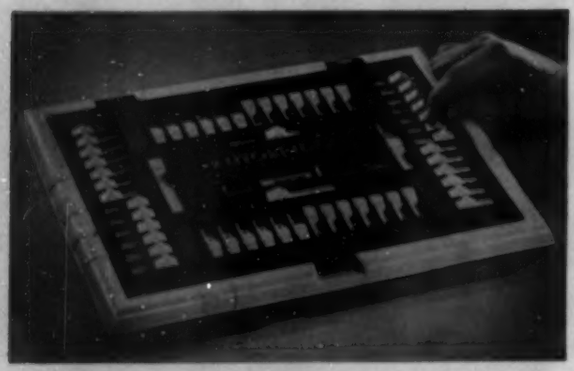
"SOMETHING DIFFERENT; SOMETHING NEW and exciting," Christmas shoppers are heard murmuring parrot-like in the mad scramble from store to store, from counter to counter, hot on the trail of the "perfect" gift for members of the family and friends. Different, new and exciting are these plastic contributions to the season, and more—they've beauty, permanence and utility. 1. Cora Scovil caters to feminine foibles with a square, two-faced mirror. It has a corded border of clear methyl methacrylate that wanders off at the base into a thin curved handle ending in a loop: She'll make it in green, blue, yellow, or red, too, for color matchers. 2. F. E. Nolan comes through for men with stiff-bristled military brushes which boast a woodsy touch in their laminated woven veneer backs. (Saart Bros. Co.) 3–4. Don Manning sculptures glittering table ornaments—short and long little doggies, flying gulls and lively horses—from thick sheets of methyl methacrylate. He splits and spreads the material for underpinnings, ears and wings, and these unpolished portions are a frosty contrast to highly polished bodies. (Janis-Tartar, Greeman and Najeeb.) 5. C. K. Castaing chooses the same material for transparent letter-openers and skillfully carves dainty floral and nature motifs at the top. 6. From two-toned laminated plastic, Mr. Castaing fashions decorative table mats for hot dishes. His designs, cut through the top laminate, are outlined in the base color to make them stand out in pleasant relief.





PLASKON

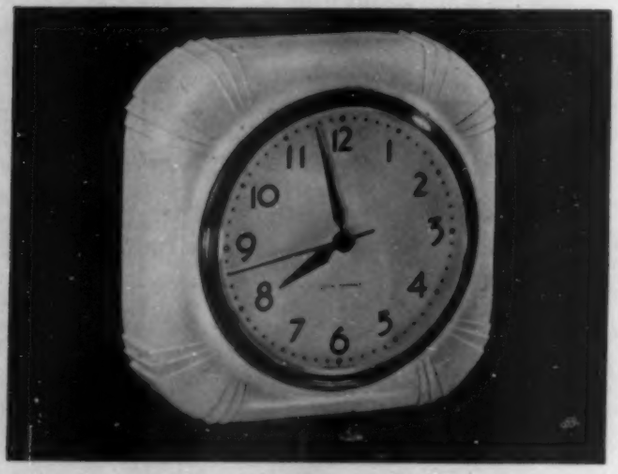
Among the ten outstanding Plaskon applications of 1938 is the Detrola Peewee. Prize-winner in the Modern Plastics Competition, the Detrola is molded of ivory and scarlet Plaskon.



Biggest game hit of the year is a Plaskon job. Ivory Plaskon base of Autobridge was selected by jury of stylists and bridge experts, headed by Ely Culbertson, for contrast, for soft translucent lustre, and resistance to abuse.

The swing from dark materials to light-colored, airy-looking ivory Plaskon for wiring devices is a modern day phenomenon. Decorators prefer this rich Plaskon color because it blends with modern decoration.

Another Plaskon achievement of 1938 is the Toledo Guardian Scale. Completely redesigned in snowy white Plaskon, this scale showed how large housings can be molded in sections. Weight saving: 97 lbs.



A smart, efficient-looking kitchen clock is the new Proctor, by Seth Thomas, released this month. Its one-piece molded case is made in ivory Plaskon and cheery Plaskon pastels to harmonize with modern kitchen colors.

PLASKON

2121 SYLVAN AVE.

CANADIAN AGENT CANADIAN

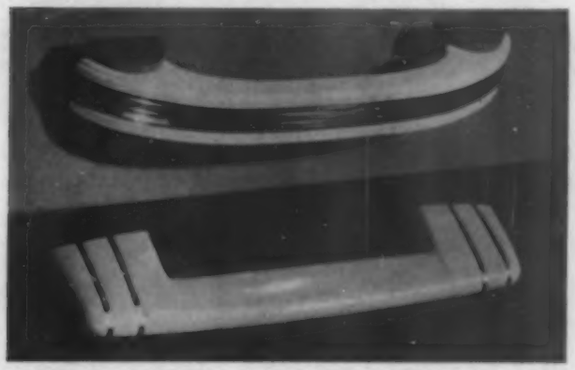
MOLDED COLOR

Leading packages of the year are by Hamilton Watch Co. Richly engraved, wiped-in with brown for antique effect. Continued use of Plaskon by Hamilton (first box appeared three years ago) proves its sales appeal.

This year, more people bought I.E.S. lamps than ever before, and more of them had Plaskon reflector bowls. They're preferred for fixtures and other lamps, too, because of lighter weight, shatter-resistance, more uniform illumination properties.

COMPANY INCORPORATED
TOLEDO, OHIO
INDUSTRIES LTD., MONTREAL, P.Q.

Smartest Plaskon compact of the year is Bourjois' Evening In Paris, designed and produced by Scoville. Deep blue Plaskon base is smoothly rounded and chip-proof.



Handles of Plaskon by the hundred thousand, and knobs and fittings, too, are found on America's stoves, refrigerators, cabinets and furniture. Reasons: color, smooth and pleasant surface, chip and wear-resistance.

1938 was a big year for buttons, and millions were molded of Plaskon. Besides decorative buttons and buckles in gay colors for women's wear, Plaskon buttons are widely used on men's shorts and shirts.

PHOTO COURTESY BAKELITE

No, we're not peeking into our neighbor's dining room. For this is a room done in the latest modern doll-house furnishings. The durable, sturdy toy table, chairs and buffet are of phenolic, molded in England

PLAYTHINGS

With lustrous color and clean design, toys go modern

THE TOYS THAT MILLIONS OF children will find in their stockings and under their trees this Christmas are quite different from those we once played with so blissfully. The sophisticated boy or girl of today isn't satisfied with heavy cast iron locomotives or the wooden horses-and-wagons of our childhood. They are not willing to play happily hours on end with pieces of roughly carved wood, daubed with paint that we so readily accepted as policemen and soldiers. Color and streamlined modernism are what they want in their playthings. And the grown-up Santa Claus who buys them wants economy and durability. Both are likely to get what they go after for toy makers are paying more attention than ever to giving both the buyer and the child what they demand.

Before one year's crop of toys are off the shelves, manufacturers have their development men at work to devise new attractions and to find better materials with which to make them. No firm can fall behind very long in getting out new features nor in keeping touch with the everlasting demand of the kids for newness. Toy making has become too much of a highly competitive business with too critical a group of customers for that. With such intensive search for new ideas being carried out, it is not surprising to find that in many instances toy makers have turned to plastics. Not only are their development departments interested in these modern materials but the production people like them too. While designers appreciate the freedom that these materials give them, the men in the shops find they are able to get their pieces out more quickly and with greater ability to keep up with rush production schedules. Both have come to realize their possibilities and are making the most of them. Of course cellulose nitrate was used for years to make tiny dolls and floating animals. But these toys, because of their inflammability, were not entirely safe. After a

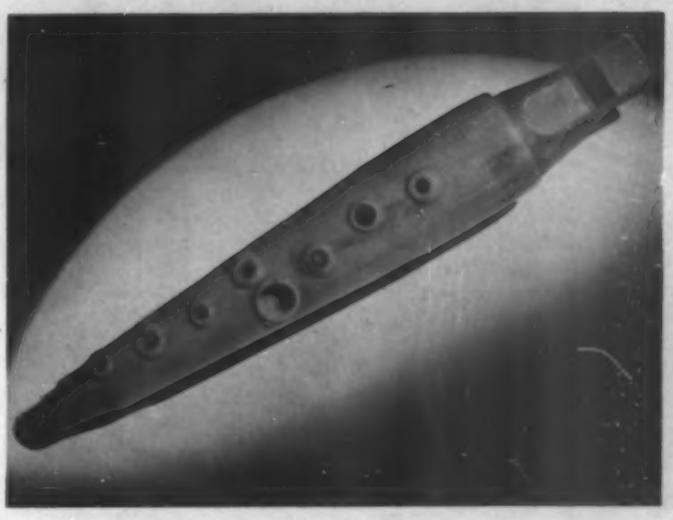
while parents became hesitant in buying and dealers in stocking them and manufacturer turned to newer, less hazardous materials. The introduction of injection molding made it possible to turn out large quantities of novelties in cellulose acetate and other thermoplastics that were safe and attractive.

Developments, though, have not been confined to any one process or material. Both compression and injection molding have been investigated for making more substantial items in a wide range of thermoplastic and thermosetting compounds, and in many cases, adopted with success.

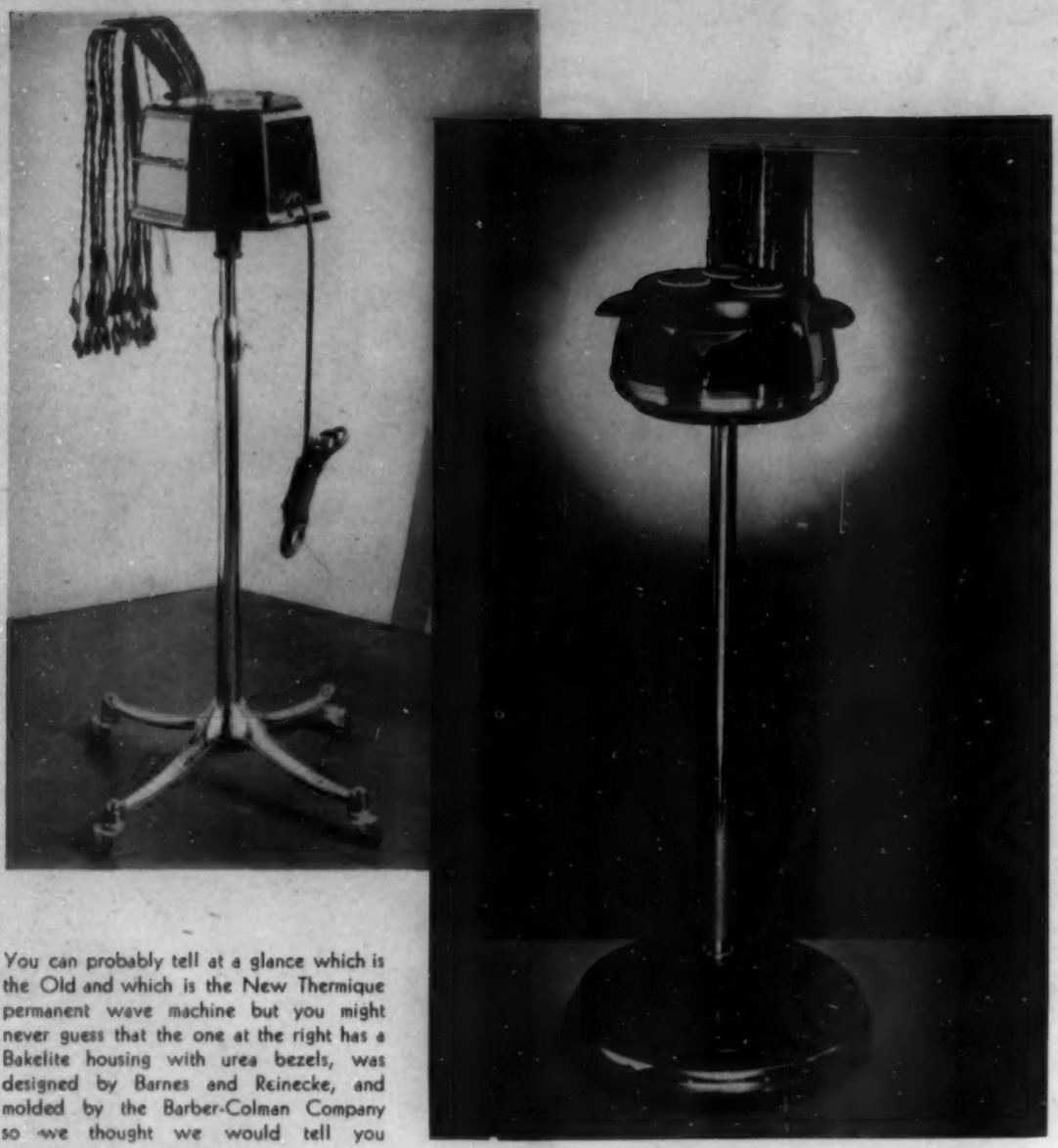
Electric trains have come to be such a popular form of plaything that some homes on Christmas resemble a miniature railroad electrification project (often with the children of the house standing by to watch more mature engineers enjoy their gifts). A number of the new gadgets available for use with these fascinating sets are made of molded phenolic. The A. C. Gilbert Company, maker of American Flyer trains uses it liberally in their new line. The engine, tender and several of the cars in one of their sets are shiny black, molded to give an appearance strikingly like that of a full-size steam train, all polished and bright. Wheel trucks, with simulated springs and journal boxes, are likewise molded, thus eliminating the need for a third rail. The current flows through two rails, one of which is insulated against the roadbed. Besides insulating the system, these parts serve to reduce the clatter and clank that Christmas usually brings to a household. The Lionel Corporation has also increased the moldings used in their popular equipment as described elsewhere in this issue.

The British have been doing interesting things in molded toys. For some time they have been selling cleanly designed miniature furniture. Made up along modern lines and molded in appropriate color schemes, the sets appeal to young girls who have leanings toward home decoration.

An application of injection molding which, while not strictly a toy, should attract attention around Christmas time, is the Tonette. This is a flute-like musical instrument designed to teach children the elements of music when they are still too small to be started on regular instruments. The Chicago Musical Instrument Co., its promoter, designed the Tonette with thin films covering two of the holes in the barrel. Punching through these films gives the Tonette a full chromatic scale. This is an instance of advanced molding technique applied to a novelty. The holes in the tube, arranged to fit tiny fingers, had to be made with *(Please turn to page 68)*



The juvenile gun-toter will have difficulty notching the plastic butts on these toy revolvers (top) but he won't be able to break them or scratch their pearl-like surfaces easily either. They are injection molded of Tenite. Learning the scales is all fun on the Tonette (center), molded of Tenite by the Elmer E. Mills Corporation. Its small enough for tiny fingers, yet large enough to make real music. Kids can't resist the lure of blowing the G-man siren (bottom). The clean sanitary surface of this molded Durez whistle makes it appealing to parents too



You can probably tell at a glance which is the Old and which is the New Thermique permanent wave machine but you might never guess that the one at the right has a Bakelite housing with urea bezels, was designed by Barnes and Reinecke, and molded by the Barber-Colman Company so we thought we would tell you

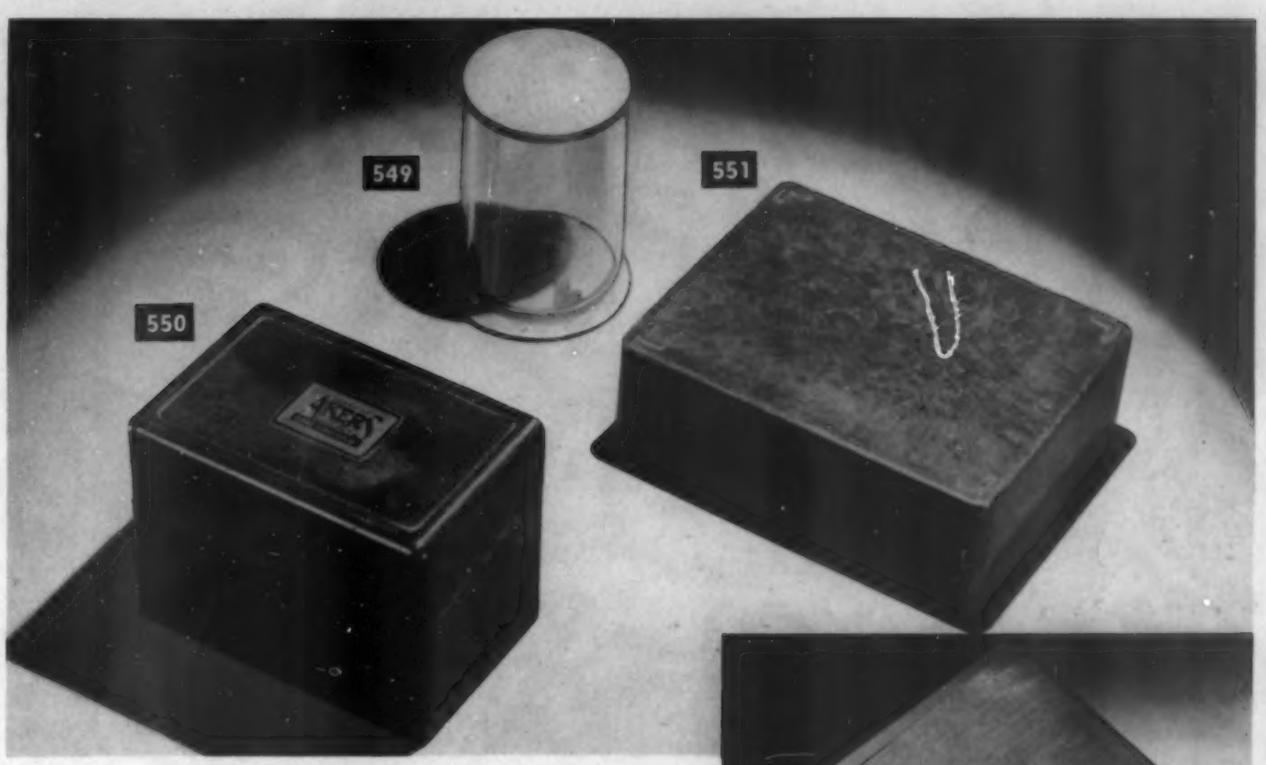
IT WAS JUST LAST SPRING THAT THE W. G. SHELTON COMPANY decided to redesign their Zephyr Thermique permanent wave machine, and it was just this Fall that the machine got into production, but the Zephyr's sales performance to date, according to Shelton advertising manager H. W. Cost, is "something to wave about." Beauty operators like it because it's easy to move about, easy to work with and easy on the eyes. The Shelton Company likes it because it has a molded phenolic housing which has a permanently smooth, glossy surface, and which is far lighter in weight and substantially less expensive than the casting formerly used.

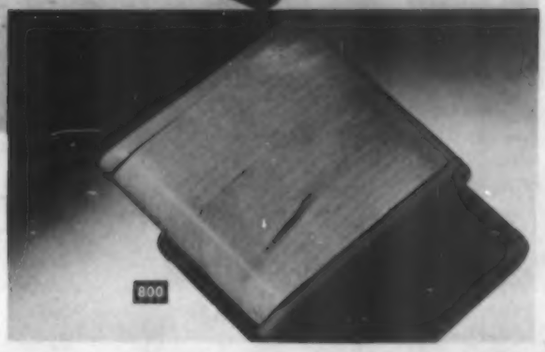
Construction of the hair-waver further defines the trend toward the use of molded parts in assembly with metal or other materials, a common-sense approach to the advantages and applications of plastics for their economy and durability. The two-pound housing which encloses the machine's transformer, voltage adjuster and timer, is molded of general-purpose black phenolic, although another model uses handles of white urea, with white urea also used as the bezels of the control dials. In addition to the plastic and metal unit, the redesign is distinguished by the elimination of conventional four legs in favor of concealed easy-roll casters.

STOCK MOLDS

SHEET SIXTY-SEVEN

Many cigaret cases, serving trays and boxes are available without mold costs from stock molds. Usually they are obtainable in a variety of materials and colors. Names and addresses of the molders will be supplied on request.





549. Transparent cigaret box with molded base and cover, and sides of cellulose acetate. The cover measures 2 5/8 in. diameter with an overall diameter at the base of 2 3/4 inches

550. Molded phenolic card index box with hinged cover. The box measures 5 1/16 in. by 3 3/16 in. with an overall height of 4 inches

551. This molded box has four threaded holes. It measures 6 7/16 in. by 4 15/16 in. The height is 2 5/16 inches

727. Serving tray with handles for easy grip. Outside dimensions 21 1/2 in. by 13 in. 5/8 in. deep inside. Molded of black phenolic

728. Undecorated tray 16 3/8 in. by 12 in. outside, 1/8 in. thick. Also of black phenolic

800. Wooden cigaret case with molded urea top and base. The ends are attached with elastic bands for filling and dispensing. 3 3/8 in. square overall

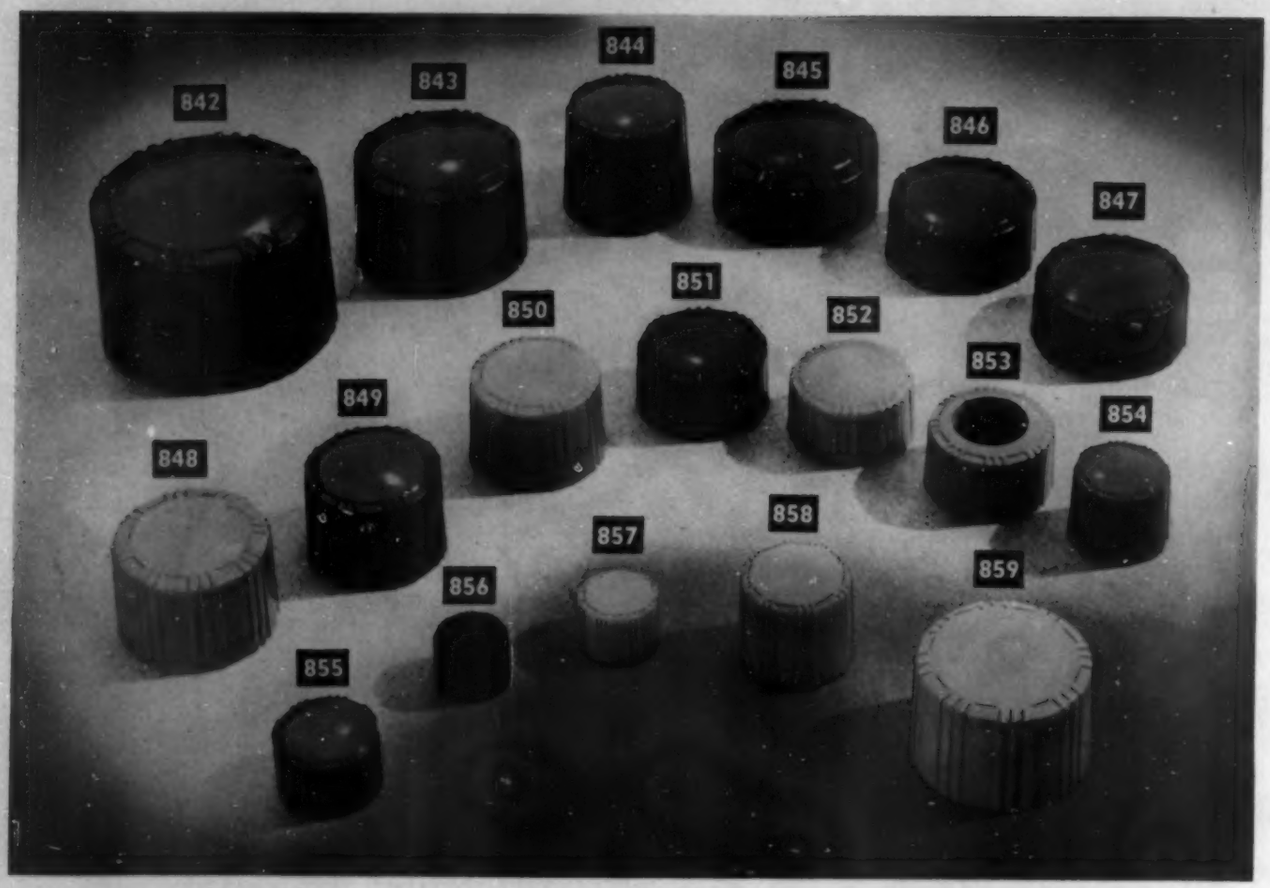
Reprints of sheets One to Fifty-Two in book form, 25c in coin or stamps

Address all inquiries to Stock Mold Department, Modern Plastics, Chanin Building, N. Y. C. All molders are invited to send samples from stock molds to appear on this page as space permits

STOCK MOLDS

SHEET SIXTY-EIGHT

Modern closures for use on bottles of various sizes are available without mold costs from stock molds. Interested executives will be supplied with molder's name and address on request.



Sheets One to Fifty-Two reprinted in book form, 25c in coin or stamps

These closures are all threaded to fit bottle necks of standard sizes and are available in the following dimensions:

842. 40 mm. diameter, 22 mm. wall height

843. 28 mm. diameter, 20 mm. wall height

844. 20 mm. diameter, 22 mm. wall height

845. 28 mm. diameter, 13 mm. wall height

846. 24 mm. diameter, 12 mm. wall height

847. 24 mm. diameter, 12 mm. wall height

848. 22 mm. diameter, 17 mm. wall height

849. 20 mm. diameter, 16 mm. wall height

850. 20 mm. diameter, 16 mm. wall height

851. 20 mm. diameter, 12 mm. wall height

852. 18 mm. diameter, 12 mm. wall height

853. 18 mm. diameter, hole in top for dropper is 12 mm. across

854. 13 mm. diameter, 10 mm. wall height

855. 13 mm. diameter, 14 mm. wall height

856. 8 mm. diameter, 9 mm. wall height

857. 10 mm. diameter, 10 mm. wall height

858. 18 mm. diameter, 16 mm. wall height

859. 24 mm. diameter, 18 mm. wall height

Address all inquiries to Stock Mold Department, Modern Plastics, Chanin Building, N. Y. C. All molders are invited to send samples from stock molds to appear on this page as space permits

PHOTOS COURTESY AMERICAN CONCRETE AND STEEL PIPE COMPANY

Standard spray-gun equipment is used in corrosion-proofing large tanks and other vessels that must stand rigorous conditions. The solution is applied cold

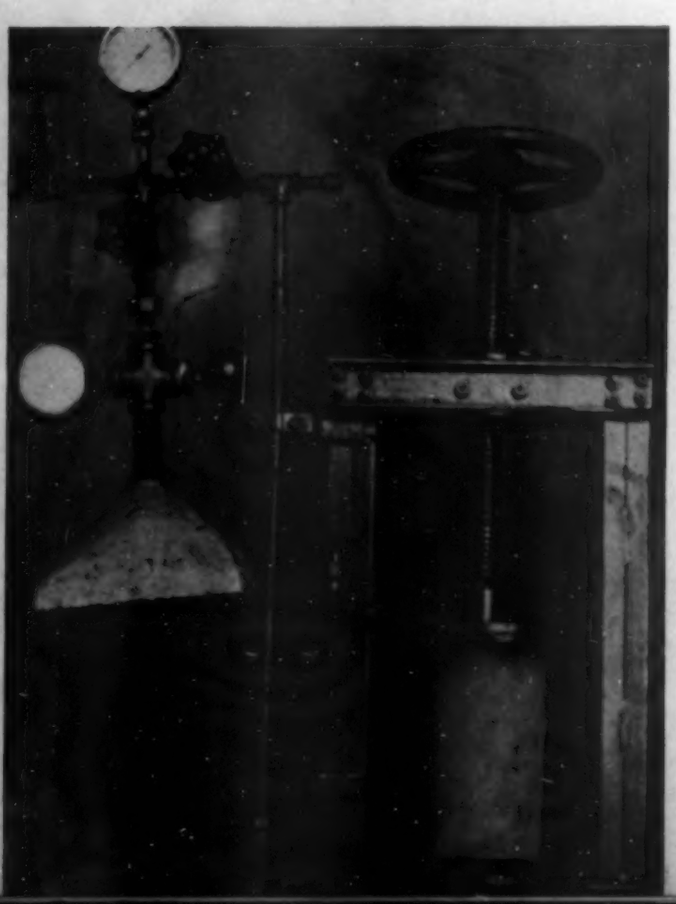
A NEW ADAPTATION OF PLASTICS TO CORROSION-PROOFING

by FRANCIS L. CARSON

SEVERAL YEARS AGO THE WRITER WAS EMployed by a large West Coast construction company to develop an impervious lining material which, when applied to concrete pipes and structures, would fit them to serve for septic sewer structures. The major problem involved was that of protecting concrete with a tightly adhering impervious lining against infiltration of liquids or acids of basic character and gases arising from the same. The experiments and developments conducted in this case resulted in successful commercial products and the materials thus developed were so patently fitted for the larger field of general corrosion proofing in industry that the research was carried on to the present day. The results of this research are described in this paper.

The early work brought out the fact that four types of synthetics held forth promise for use in the proposed field: one, the synthetic rubbers of the chloroprene family; second, the product of phthalic anhydride and glycerol condensation; another, the group of polymerized vinyl chloride and acetates; and the last, the acrylates. All were found to possess merit; none were found to provide all of the required qualities. After protracted work, it was found that blends of these materials could be made within ranges of compatibility which would provide final base materials possessing all of the necessary properties.

Solutions of these blends were made; aggregates were compounded therein and mixtures fitted to present-day spray equipment were developed. Laboratory and field tests started in September and October of 1935 have been continued to the present day, with gradual improvements in the application methods. A shortening of the curing



Acid-proof brick (top), in use by Texas Oil Co., put together with the new plastic joining material and partly sealed over with the plastic mixed with aggregate. Before adoption for any proposed use, the material is subjected to exacting tests, such as in the erosion trough above, or in the pressure machine at the right, through which detailed reaction data may be obtained

time was effected and variations in color were perfected.

In the preparation of paints adaptable to brush and spray work, gelatinized trowelable plastics, and variously pigmentized pastes for subsequent dilution in the field, full advantage was taken of the present-day organic solvents to assure feasibility of application by unskilled labor under the disadvantageous conditions so frequently found in the field.

The major products produced to date from the described plastics are as follows. Trowelable coatings for applications to surfaces subject to impact and erosion as well as the corrosive influences of liquids, such as for ship decks, warehouse floors—and pavements subject to acid conditions. Solutions for spraying and brushing which are fast drying and designed for preventing corrosion under all submerged conditions. Paints in all colors for exterior and interior exposure as a reliable protection for wood, concrete, and steel surfaces under severe service conditions.

Marine hull surfacing

Tests on the bottom of fishing boats sailing to Central American waters, on tankers traveling North and West, —in the test chamber of the Los Angeles Harbor Department Laboratory, all proved the anti-fouling and corrosion-proofing ability of the film. The finally perfected material meets all the necessary requirements. It is producible in any desired color from white to black. Ships' bottom coatings are thought to serve best in the usual reddish-brown of commerce. The coating applied by brush or air spray means in three stages, one right after another, is ready for immersion within one hour after the application of the final coat. Thus no expensive delays are encountered while the coating dries.

Tanker linings

The Journal of Commerce Annual Review, Jan. 1, 1930, points out the required qualities of a tank coating suitable for petroleum cargo ships. These requirements are outlined approximately as follows:— It must:

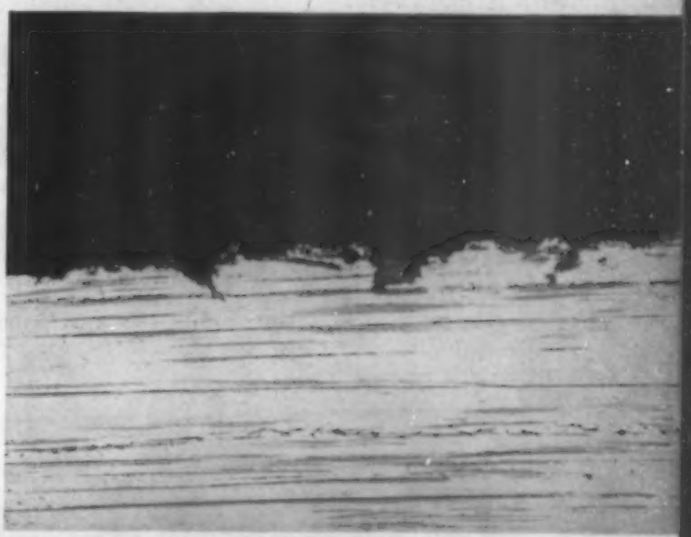
1. Be capable of neutralizing incipient oxidation of steel.
2. Enter into actual physical combination with the surface coated and resist flaking when that surface deflects under load and expands or contracts under change of temperature.
3. Withstand the washing action of petroleum spirits, salt water ballast, and condensed steam.
4. Withstand the effect of steam during tank steaming operations. It should be non-slipping and non-blistering under the action of heat.
5. Possess a very low water and petroleum absorption factor.
6. Not discolor petroleum spirit cargoes.
7. Remain unaffected by humid atmosphere while being applied, and cling tenaciously to the steel under all conditions.
8. Possess dielectric qualities capable of providing adequate protection against electrolysis.
9. Possess efficient water-shedding qualities and be chemically stable under all conditions of service.
10. Retain its protective qualities for a sufficient time to assure its application being a commercial success.
11. Remain a homogeneous solution which will not "set" during the period of application.
12. Be sufficiently thin to fill in completely any depressions in the surface of the steel.
13. Be capable of being applied without liberating low flash inflammable gases likely to be harmful to those applying it.
14. Solidify ready for service in a reasonable time and be capable of being applied cold by unskilled labor.
15. Not require staging to apply nor sand blasting the steel for application.

The developed coating material under discussion herein has been found to qualify on all the points named.

Field tests in the tanks of several fishing steamers were conducted over a year's time with perfect results. These boats go to sea with steel tanks filled with white oil fuel for the outbound voyage. They are washed out with steam and lye soap; filled with sea water and fish on the return trip to port. The linings in these fish boat tanks have proven their cargo boat tank qualities of fitness for petroleum linings wherein they meet identically the same conditions.

As a relief for "static" induced within the steel walls by friction, vibration, etc., it is only necessary to place zinc bars at various available points, said bars projecting into the water from threaded junctures with the hull through the protective coating. These bars or rods will form escape valves for "static" and any corrosion occasioned by that escape will demonstrate itself on the renewable bars, thus protecting the whole steel structure.

A synopsis of the complete laboratory tests to determine insolubility, impermeability, and acid-and base-proof qualities follows. In October 1935, small pipes were plugged at one end and were *(Please turn to page 68)*



Below, a section through a joint of two cement concrete pipes with the new material used to form a corrosion and erosion resisting joint. A complete erosion testing unit (lower right) is set up to simulate conditions of actual service. Above at the right, a photomicrograph (100 X) shows the close, even adhesion of Amercoat to a roughened steel surface

POWER FACTOR MEASUREMENTS

by E. O. HAUSMANN and WM. F. SANDS*

Equipment for measurement of power factor and dielectric constant of solid electrical insulating materials at radio frequencies

THE NEED FOR POWER FACTOR MEASUREMENTS of insulating materials arose when it was apparent that the radio industry had outgrown its swaddling clothes, and was ready to go far beyond the narrow confines of experimental receiving stations. In the latter part of 1917, the principal manufacturers of insulation petitioned the National Bureau of Standards to define tests which would determine the suitability of materials for radio applications.

Inasmuch as the government was, at that time, using large quantities of phenolic insulating materials for the War and Navy Departments, work was started at once.[1] The results of this extensive investigation were published in 1922, but description of the methods did not appear, however, until 1923.[2] Using this work as a basis, the American Society for Testing Materials first issued the universally used Tentative Standard D-150 in 1922.[3]

Early Apparatus

Knowledge of high frequency instrument design, and of the errors to be encountered was naturally not as extensive twenty years ago, as today. Routine measurements were not only tedious, but were quite open to suspicion as to their validity. Definite cases where negative values for dielectric loss had been secured due to coupling effects, are known to the authors.

An example of the type of equipment in use in 1926 is shown in Fig. 1. The oscillator was mounted in the rear of the large upright panel and its size was considerably augmented by large banks of storage plate supply batteries and charging equipment. The measuring circuit was spread out on the table portion of the setup.

It was inevitable that the constant care of the storage type A and B batteries would be a constant source of annoyance. Trouble was experienced due to (1) electrostatic coupling between oscillator and test circuit coils; (2) the "breadboard" arrangement of the measuring equipment and the resulting variable leads; and (3) the

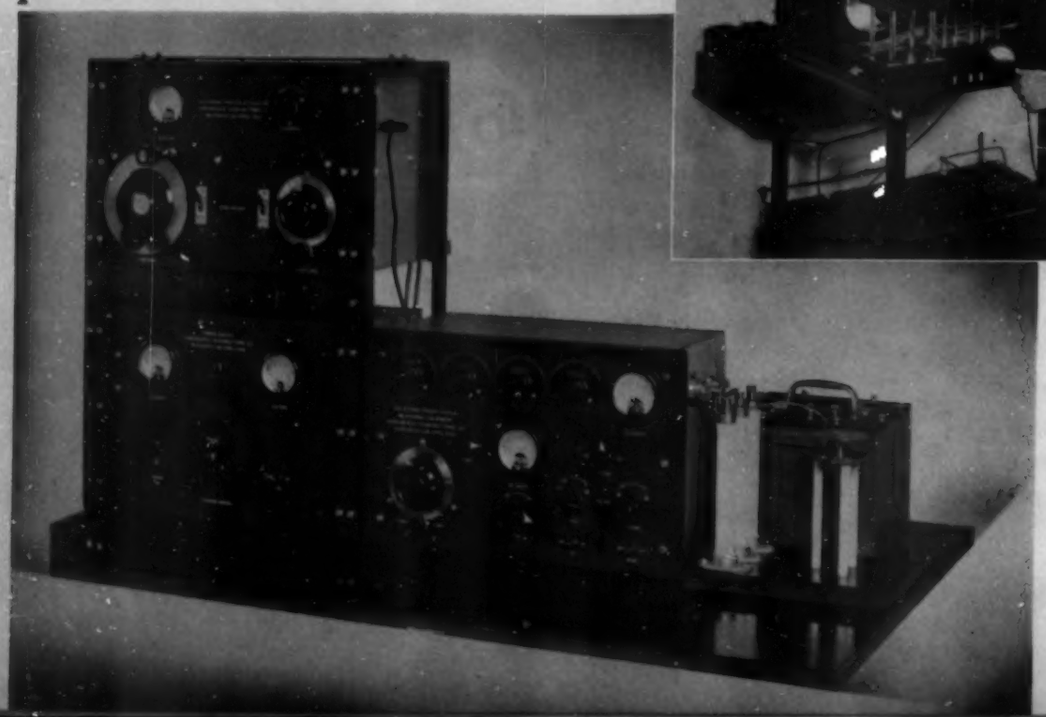
1

* Continental-Diamond Fibre Company.

1. J. H. Dellinger and J. L. Preston, "Properties of Electrical Insulating Materials of the Laminated Phenol-Methylene Type," B.S. Tech. Paper #216 (1922).
2. J. H. Dellinger and J. L. Preston, "Methods of Measurement of Electrical Insulating Materials," B.S. Scientific Paper #471 (1923).
3. "Tentative Method of Test for Phase Difference (Power Factor) and Dielectric Constant of Molded Electrical Insulating Materials at Radio Frequencies," A.S.T.M. Tentative Standard D-150-22T (1922).

The development of the highly perfected instrument below (Fig. 2) was built on experience gained through the use of the earlier, less precise equipment shown at the right (Fig. 1)

2



Triggerettes molded by
Detroit Macoid Corp.

TENITE

solves the gift problem for thousands

TENITE again demonstrates its adaptability for rapid injection molding by performing a difficult job in only a few seconds. This novel cigarette dispenser requires a mold with 20 movable pins in order to form individual cavities for the cigarettes. The plastic must flow down and around each pin, and weld before cooling—a noteworthy accomplishment for any injection molding material.

The rich, lustrous colors of Tenite make this container an attractive smokers' accessory for the home or office. Economy of production and simplicity of assembly place it in the class of luxuries that everyone can afford.

Tenite is a tough, resilient plastic, made from Eastman cellulose acetate in all colors: plain, variegated, translucent, and opaque. A 52-page book on Tenite will be sent on request.

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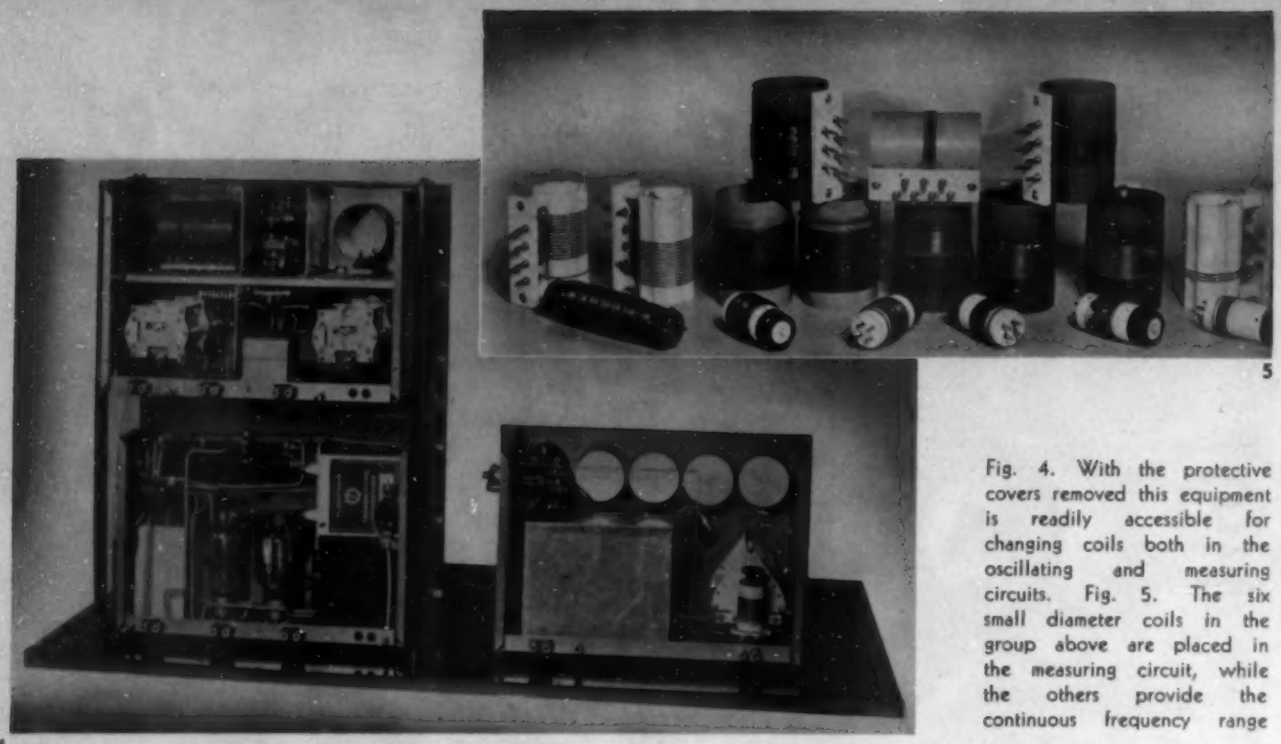


Fig. 4. With the protective covers removed this equipment is readily accessible for changing coils both in the oscillating and measuring circuits. Fig. 5. The six small diameter coils in the group above are placed in the measuring circuit, while the others provide the continuous frequency range

amount of R. F. power required to produce full scale deflection of the thermal indicating device.

Present Equipment

It was decided in 1934 to construct apparatus which would have the following general specifications:

Oscillator:

(1) To be completely operated from the power line.
(2) Continuously variable from 100 kilocycles (10^5 cycles) to 25 megacycles (2.5×10^7 cycles) by means of readily interchangeable plug-in coils.
(3) Accurate frequency calibration over entire range.
(4) Standard rack and panel mounting with removable covers, for servicing.
(5) Excellent frequency and amplitude stability to be secured by well designed circuit components and use of the electron coupled circuit.
(6) Output variable over a wide range.

Measuring Circuit:

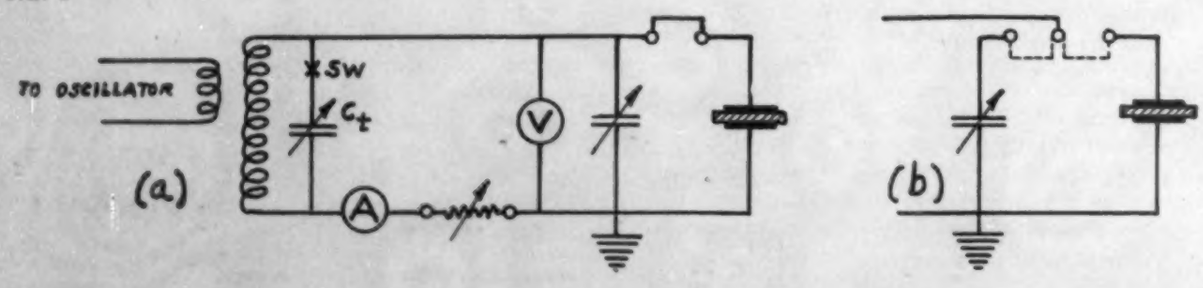
(1) Pickup system and coil to be well shielded.
(2) Continuously variable resistor box.
(3) Vacuum tube voltmeter used as a resonance indicator.
(4) Control portion of the equipment to be mounted in metal cabinet of same type as oscillator.
(5) Use of a standard precision condenser, with worm-type micrometer drive.
(6) A universal electrode stand in which anyone of a series of lower electrodes may be used and which has been further improved by elimination of the ground side of the mercury switch.

The equipment illustrated in Fig. 2 embodies all of the above features and should serve for rapid routine tests for quite a few years without any major changes in design. Measurements may be made either by the replacement substitution method (Fig. 3-a),[4] or by direct substitution in the circuit (Fig. 3-b),[5] merely by changing the leads to the electrode stand. The auxiliary tuning condenser C_t may be removed from the circuit by means of the switch SW, inasmuch as it is generally used only for the direct substitution tests.

Details of construction are shown in Fig. 4 where the protective covers have been (*Please turn to page 70*)

4. A.S.T.M. Standards on Electrical Insulating Materials, D-150-36T, page 248 (1937).
5. A.S.T.M. Standards on Electrical Insulating Materials, D-150-32T, page 100 (1933).

FIG. 3



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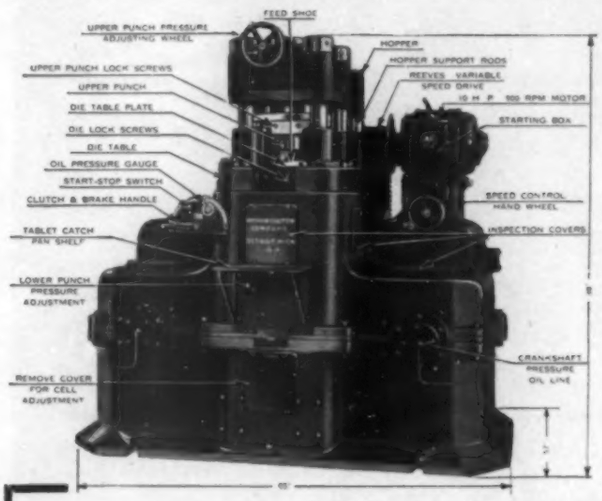

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Plastics Digest

This digest includes each month the more important articles (wherever published) which are of interest to those who make plastic materials or use them

General

BEHAVIOR OF PLASTICS UNDER VARIOUS SERVICE CONDITIONS. R. P. Cartwright. Trans. Inst. Plastics Ind. (London) 7, 79–96, 101 (July 1938). The true softening point of a plastic is regarded as the temperature at which the relation between temperature and strain for a constant stress changes from a straight line (elastic) to a bent curve (non-elastic). The problems of shrinkage, cracking, and embrittlement because of aging under heat, chemical reaction, or absorption of moisture are considered and experiences in impregnation of coils with various plastics described. The author feels that the plastics industry should conduct organized research into the fundamental problems connected with plastics in order that their use will give minimum disappointment and maximum satisfaction to all concerned and that, where possible, means of correlating and co-ordinating existing efforts should be sought.

SILK'S LAST BATTLEGROUND? Textile World *88*, 55–6 (Oct. 1938). The development of "Nylon" (Fiber 66) and "Vinyon" (formerly "Vinyarn") may mark the beginning of a new era in textile manufacture in which natural fibers are substantially replaced by synthetic resin fibers of various types. The first mentioned fiber is believed to be the polyamide resin product covered by U. S. Patent 2,130,948; these fibers are said to have high tenacity, lack of sensitivity to high humidities, exceptionally good elastic recovery and aging characteristics, and extraordinary resistance to solvents and chemical reagents. A reference to the properties of the vinyl resin fiber (Vinyarn) will be found on page 48 of the Sept. issue of Modern Plastics.

CHEMICAL TRENDS IN THE PETROLEUM INDUSTRY. Per K. Frolich. Ind. Eng. Chem. *30*, 916–22 (Aug. 1938). This survey includes a list of twelve plastics for which the raw materials are potentially or actually supplied by the petroleum industry.

PLASTICS. S. Ranganathan and H. K. Sen. Proc. Inst. of Chemists (India) *9*, Part III, 157–83 (1937). A review.

Materials and Manufacture

COLORLESS KETONIC RESINS. G. Morgan, N. J. L. Megson, and K. W. Pepper. Chem. and Ind. (London) *57*, 885–91 (Sept. 24, 1938). The preparation of resins by condensation of formaldehyde with various ketones, particularly acetone and methyl ethyl ketone, is described. Methyl isopropenyl ketone produced from the latter polymerizes to a hard, colorless, transparent substance of brilliant luster, considered to be capable of economical large-scale production.

THERMOPLASTIC RESINS DERIVED FROM ANILINE. Rev. Gen. Mat. Plastiques *14*, 217–21 (Sept. 1938). The resin commonly known by the trade name "Cibanite" is made by the combination of formaldehyde with aniline with the elimination of water and subsequent rearrangement of the hydrochloride addition product into p-aminobenzyl chloride which condenses immediately into a polyaminobenzyl compound. In the presence of formaldehyde this polymer condenses into a three dimensional molecule through reaction at the active positions ortho to the amino group. The resin is thermoplastic and can be molded with or without fillers. The properties of the molding compound and paper-base laminate are listed.

PLASTIC MATERIALS; SOME RECENT DEVELOPMENTS. Electrician *121*, 184 (Aug. 12, 1938). A new shock-resisting molding material prepared by impregnation of the fibers with an aqueous emulsion, precipitation of the resin in the fibers, and conversion of the fibers into sheets, is described. Bitumen and rubber which are ordinarily incompatible with the resins can be incorporated with them in a molding composition in this manner.

PROTEIN PLASTICS FROM SOYBEAN PRODUCTS. G. H. Brother and L. L. McKinney. Ind. Eng. Chem. *30*, 1236–40 (Nov. 1938). The action of hardening agents on soybean, casein, and zein (corn) protein materials as evidenced by their efficiency in lowering absorption of water was investigated. It is concluded that the best plastic is produced by treatment of commercial soybean protein in its isoelectric range with formaldehyde.

CASEIN PLASTIC PRODUCTION. Otto Manfred. Kunststoffe *28*, 259–61 (Oct. 1938). Deaeration of the mixture and milling instead of kneading the casein plastic mass yield a product with improved properties.

Molding and Fabricating

THE BORDER LINE BETWEEN SINGLE AND MULTI-IMPRESSION MOLDS. H. F. Mills. Trans. Inst. Plastics Ind. (London) 7, 65–78 (July 1938). This discussion of the basis of selecting the number of impressions in order that the tool shall have a maximum output, minimum amount of waste due to flash, and a minimum initial cost seems to be well summarized by the chairman's statement that "there are still a tremendous number of outside factors which are going to govern us and we are not yet in a position to get to the bottom of the subject because we have so many different variables which are very far short of the ideal."

Applications

EXPOSURE TESTS ON PLYWOOD. Don Brouse. Mech. Eng. *60*, 852–6 (Nov. 1938). Phenolic resin glues did not soften or hydrolyze on continuous soaking in water for 4 years and were not attacked by molds after 4 years at 97% relative humidity although the mold-resistant glue line did not protect the wood itself from the action of wood-destroying fungi. After 4 years of alternate soaking and drying the specimens still developed a high percentage of wood failure rather than glue line failure. The one vinyl resin tested and blood albumin glue appeared to be sufficiently resistant to hydrolysis and mold attack but lacked the strength to withstand mechanical stresses set up by repeated wetting and drying. Casein glues were readily subject to total failure within 18 months from hydrolysis, mold attack and mechanical stresses under the above described conditions.

AIRCRAFT POSSIBILITIES OF CELLULOSE ACETATE PLASTICS. A. Klemin. Aero Digest *33*, 59–60, 63, 84 (Nov. 1938). A review of the properties and uses of cellulose acetate in non-stressed parts and its potential use in stressed members when reinforced with fibrous materials.

USE OF PLASTICS IN AIRCRAFT CONSTRUCTION. W. Küch. Kunststoffe *28*, 262–7 (Oct. 1938). The preparation of surfaces for gluing and tests on simple structural members are discussed.

MICARTA JOINTS USED IN OUTDOOR SUBSTATION. E. C. Stoever. Elec. World *110*, 730 (Sept. 10, 1938).

Testing

DIELECTRIC PROPERTIES OF CELLULOSE ACETATE. L. Hartshorn and E. Rushton. J. Inst. Elec. Engrs. *83*, 315–32 (Sept. 1938). A detailed report of an experimental study of the dielectric properties of cellulose acetate plastic including a theoretical discussion of dielectric absorption and increase of conductivity with rise of voltage gradient.

PENDULUM IMPACT MACHINE FOR PLASTICS TESTING. W. Moser. Kunststoffe *28*, 267–70 (Oct. 1938). Description of an impact machine with a range from 0.005 to 10 mkg. and a presentation of the results of tests on the effect of variations in the weight and velocity of the hammer on the measured values.

NEW TESTING METHOD FOR HARDENED PHENOL RESIN MOLDING MATERIAL. W. Esch and R. Nitsche. Kunstharze und andere plastische Massen Wiss. Tech. *8*, 249–50, 252–3 (1938). By immersion in melted alpha naphthol, phenolic resins can be entirely removed from fillers, thus permitting analysis and determination of the structure of the fillers.

CHEMICAL ANALYSIS OF ORGANIC PLASTIC AND LACQUER MATERIALS. G. Bandel. Angewandte Chemie *51*, 570–4 (Aug. 27, 1938). A systematic procedure for qualitative analysis of plastics is presented.

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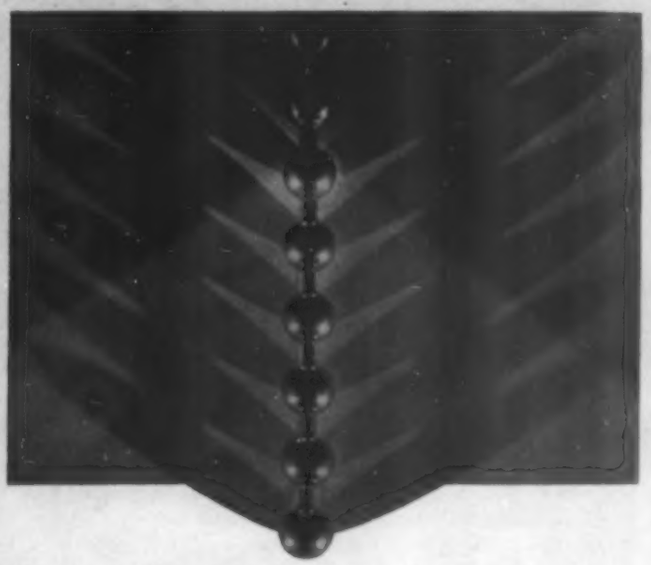

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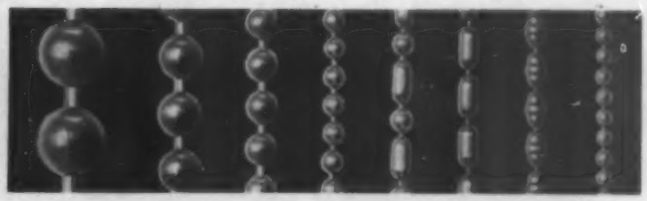

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U. S. Plastics Patents

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PROJECTION SCREEN. Rupert H. Draeger. U. S. 2,132,405, Oct. 11. A fine grain translucent projection screen is made after the manner of safety glass, the interlayer being composed of two cellulose acetate films, each with both faces ground to a nondirectional diffusing surface.

SOLUBLE RESIN. H. S. Rothrock (to E. I. du Pont de Nemours and Co.). U. S. 2,132,442, Oct. 11. An insoluble alkyd resin is rendered soluble in organic solvents by converting its unesterified carboxyl groups to amide groups and condensing the product with formaldehyde.

PRINTING INK. A. A. Harrison and S. H. Oakeshott (to Imperial Chemical Industries, Ltd.). U. S. 2,132,468, Oct. 11. A spirit ink comprising a cellulose ether, a solvent and a soluble dye, compounded to give fast drying and low penetration tendency.

MORTICIAN'S COMPOUND. F. E. Williams (to Marbon Corp.). U. S. 2,132,665, Oct. 11. A skin seal for use by morticians contains amorphous rubber hydrochloride 100, magnesium oxide 30, titanium dioxide 2, hexamethylenetetramine 2 and a red dye 0.015 part, all dispersed in a solvent.

POLYMERS. D. E. Strain (to E. I. du Pont de Nemours and Co.). U. S. 2,135,443, Nov. 1. Polymerizing acrylic acid or its homologs, or their esters or nitriles, in a solvent for the monomer; the polymer is insoluble in the solvent and is precipitated.

COLORING LACQUERS. F. Straub and H. Meyer (to Society of Chemical Industry in Basle). U. S. 2,132,810, Oct. 11. Dyeing nitrocellulose lacquers with complex metal compounds of an unsulfonated arylmethane dye.

LACQUER. C. R. Fordyce and M. Salo (to Eastman Kodak Co.). U. S. 2,132,869, Oct. 11. A flexible lacquer film with strong adhesion to metals, even when bent, is made with a mixture of cellulose acetate and oxidized cellulose acetate.

PLASTICIZER. H. B. Smith (to Eastman Kodak Co.). U. S. 2,132,884, Oct. 11. Plasticizing cellulose acetate or like esters with butyl *p*-toluenesulphonamide.

MOLDING COMPOSITION. Fritz Pollak. U. S. 2,134,235, Oct. 25. Molding powder is made by condensing urea with hexamethylenetetramine and working up the product with formaldehyde and a flux.

ABRASIVE DISKS. F. O. Albertson (to Albertson and Co.). U. S. 2,132,917, Oct. 11. A backing for abrasive disks is made of a laminated fiber product impregnated with a phenolic resin.

ZEIN PLASTICS. K. M. Irey; G. J. Leuck (to Corn Products Refining Co.). U. S. 2,134,760; 2,134,764, Nov. 1. A homogeneous molding composition made by action of formaldehyde on zein and acid treated leather scrap; and a plastic made by action of formaldehyde on corn gluten in dilute hydrochloric acid.

PHOTOGRAPHIC FILM. G. F. Nadeau (to Eastman Kodak Co.). U. S. 2,133,110, Oct. 11. Interposing a synthetic resin gel layer between a photosensitized film and its cellulose ester support.

GRANULAR POLYMERS. D. E. Strain (to E. I. du Pont de Nemours and Co.). U. S. 2,133,257, Oct. 11. Emulsion polymerization of methyl methacrylate in granular form in presence of a polymerized reaction product of ammonia and methyl methacrylate.

FLEXIBLE RESIN PRODUCT. H. L. Bender (to Bakelite Corp.). U. S. 2,136,329, Nov. 8. A flexible plastic having the appearance of crepe rubber is made by forming a heat-hardening resin into a gel and mechanically disrupting the gel without melting it.

ADHESIVE. Wm. C. Wilson and C. E. Fawkes (to Pyroxylin Products Inc.). U. S. 2,133,335, Oct. 18. Dissolving a protein in a solution of a urea-formaldehyde condensation product to form an adhesive and coating composition.

PETROLATUM-LIKE PRODUCT. J. A. Anderson (to Standard Oil Co. of Indiana). U. S. 2,133,412, Oct. 18. A product of ointment consistency contains wax 10–40, polymerized olefin resin 5–50 and mineral oil at least 20%.

MOLDING COMPOSITION. E. E. Novotny (to Durite Plastics, Inc.). U. S. 2,133, 464, Oct. 18. A dry mix which can be cold-molded is made by blending a phenolic resin having up to 50% of its phenolic (hydroxy) groups inactivated, and another phenolic resin having not over 20% of its phenolic groups inactivated.

CONTAINER. M. C. Meyer. U. S. 2,133,629, Oct. 18. A cellulose derivative container having a peripheral wall cemented to a bottom plate.

UREA RESIN. C. Ellis (to Plaskon Co.). U. S. 2,133,689, Oct. 18. A molding composition contains a urea-formaldehyde resin and a latent curing catalyst such as a chlorinated aliphatic acid.

MODIFIED ALKYD. K. H. Hoover (to Association of American Soap & Glycerin Producers, Inc.). U. S. 2,133,702, Oct. 18. Making a resin from linseed oil and a glycerol phenyl ether phthalate resin.

CELLULOSE SPONGE. C. N. Brown (to E. I. du Pont de Nemours and Co.). U. S. 2,133,805, Oct. 18. A cellulose sponge is made in two layers, one with coarse and one with smaller pore size.

MILK BOTTLE CAP. R. F. Huntley (to Oswego Falls Corp.). U. S. 2,133,861, Oct. 18. A flexible transparent hood cap for milk bottles is made of cellulose ester sheeting.

ALKYD RESIN. B. W. Nordlander and M. C. Agens (to General Electric Co.). U. S. 2,133,870, Oct. 18. Modifying alkyd resins with shellac and a fatty oil or oil acids, by condensing glycerol first with the shellac and oil (or oil acids) and then with a polybasic acid.

FLEXIBLE COVERING. F. M. Beegle and H. L. Andrews, Jr. (to Congoleum-Nairn, Inc.). U. S. 2,133,886, Oct. 18. A bitumen-impregnated sheet material is coated with an aqueous emulsion of a drying oil and a water-insoluble alkali proof resin and the water is evaporated from the emulsion.

ADVERTISING MEDIUM. L. J. Burke (to Poster Products, Inc.). U. S. 2,133,914, Oct. 18. A varicolored flexible display medium is made by coating a base material on one side with a pressure-sensitive adhesive and on the other side with a pigmented, plasticized cellulose derivative followed by a coat of the clear (unpigmented, unplasticized) cellulose derivative, and printing with a pigmented cellulosic lacquer.

ADHESIVE. H. C. Roller. U. S. 2,134,006, Oct. 25. An alkyd resin, plasticized with triphenyl phosphate or the like, and blended with small proportions of an oxidized oil and raw rubber, is used as an adhesive cement.

ESTER RESINS. K. R. Brown; R. M. Goepp, Jr. (to Atlas Powder Co.). U. S. 2,134,429; 2,134,430, Oct. 25. Making resins by condensing phthalic acid, in presence of a fatty acid, with an inner ether derived from an aliphatic hexahydric alcohol; and making resins by condensing rosin with a similar inner ether.

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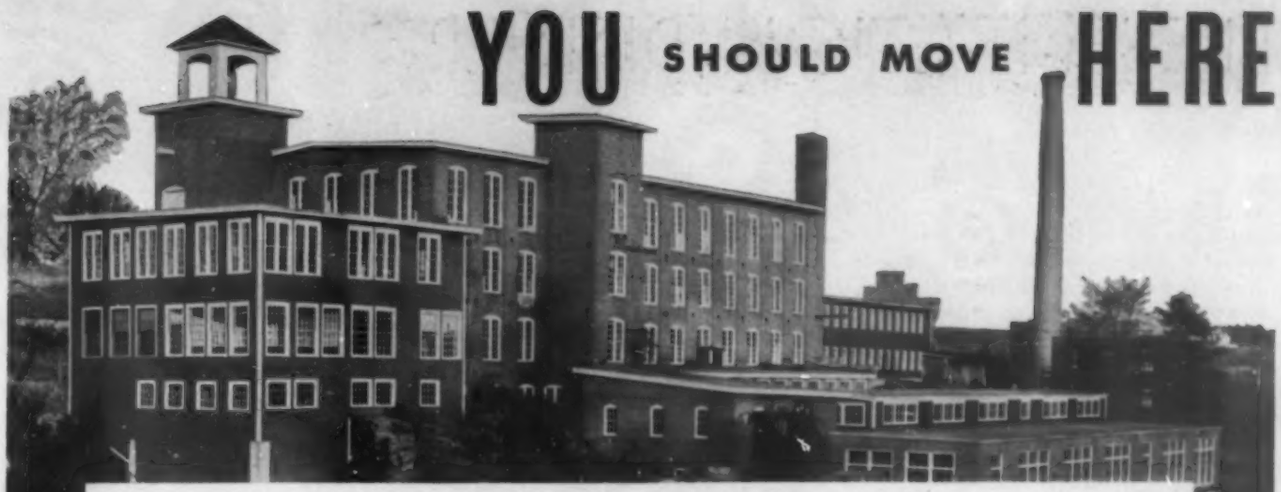

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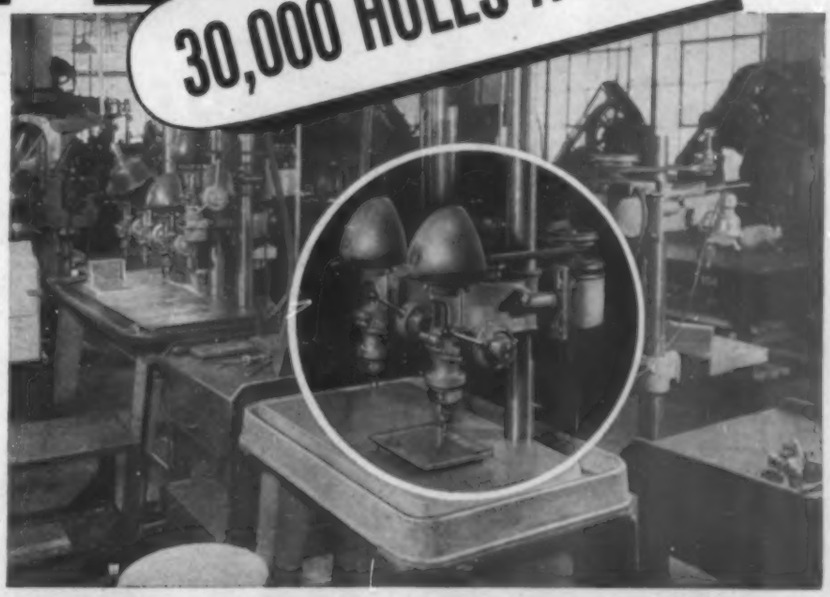

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PRESENTATION DINNER

IN THE WELL-FILLED GRAND BALL ROOM OF THE HOTEL New Yorker, New York City, on the fifteenth of November those whose entries won awards in the third Modern Plastics Competition were honored at the Presentation Dinner. Preceded by a reception in which the winning entries were exhibited, the affair was attended by more than two-hundred and fifty guests, including representatives of many companies using, making, designing, molding and fabricating plastics.

Following dinner, C. A. Breskin, publisher of MODERN PLASTICS, welcomed the guests and E. F. Lougee, editor, introduced those at the speakers' table, which included besides the speakers and judges: Sr. Vice Consul Malcolm Henderson, British Consulate, N. Y.; Asst. Director U. S. Bureau of Census, Dr. V. D. Reed, Washington; President of the Society of Plastics Industry, Allan Fritzsche; and director of the Plastics Division of the U. S. Bureau of Standards, Gordon M. Kline. Harvey Wiley Corbett, architect and designer, and A. E. Marshall, consulting engineer, spoke for the judges and explained the method of selecting the winners. Both praised the men whose research and talents have broadened the scope of plastic materials and brought into being new techniques and uses.

Kenneth Brown Collings then made the address of the evening. Mr. Collings, who has spent his life as a war correspondent, adventurer and author, recently marched into Czechoslovakia with the German troops. He described the world-stirring events leading up to the Munich agreement and explained the emotional, political and racial background of the whole series of happenings. Having been on the spot, he was able to recount the attitude of the people brought under German rule and the feelings of the soldiers as they moved into the area. In comparing the situation in this country against that in Europe, he pointed out the need for vigilance to preserve our liberties, no matter where we live.

The world premiere of "Modern Plastics Preferred," an educational picture with sound track in which the winning Competition entries appear in full color was then presented before an enthusiastic audience. The guests were particularly interested in the dramatic way in which the story of plastics was told. As an attempt to bring a knowledge and appreciation of these materials to the lay public, and to make for still greater acceptance by industrialists and consumers, this picture will be shown to hundreds of groups throughout the country during the year.

With the rest of the room still dark, the plaques won by the prize winning entries were spot-lighted on the stage. Immediately following, Mr. Lougee congratulated the recipients and presentation was made.

Among those at the winners' tables were: Max Abrams, Ellen Guth, Emerson Radio and Phonograph Co.; Dr. C. W. Adams, The Dentist's Supply Co.; C. L. Barr, F. B. Redington Co.; George Beck, Sure-Catch Lure Co.; R. J. Behan, Lockheed Corp.; Irene Bender, Associated Merchandising Corp.; Martin M. Bennett, Martin-Bennett Co.; Stanley W. Burnham, Merck & Co., Inc.; C. K. Castaing; E. A. Farr, Jay Ackerman, Manning, Bowman & Co.; A. R. Grossman, Lou Grossman, Optical Products Corp.; Dennis Guthrie, Tennessee Eastman Corp.; Russell D. John, The Adams & Westlake Co.; S. L. Kaye, Richard A. Loeb, Hans Mayer, Dr. Leo Nast, Universal Plastics Corp.; Wm. P. Lear, Lear Developments, Inc.; C. R. Lee, Jr., The Lamson Company; E. P. Johnston, Zenith Radio Corporation; Earl Mandle, designer; R. L. Murray, Autobridge, Inc.; R. D. Marshall, Automatic Products Co.; Isamu Noguchi, designer; M. S. Parker, Mrs. M. S. Parker, Parkwood Corporation; Dr. E. W. Probst, A. L. Watts, E. I. du Pont de Nemours Co., Inc.; L. M. Phillips, The Rex Co.; F. H. Rooney, Precision Scientific Co.; Louise Sanders, Louisanders, Inc.; Dr. Charles E. Sando, U. S. Dept. of Agriculture; Dr. Mayer B. A. Schier, Dr. Schier, Inc.; R. E. Schreiber, Modern Products Co.; H. J. Segrave, Mine Safety Appliances Co.; Robert E. Sommers, Deauville Bags; A. Triconi, E. Triconi, Steampoint Electric Co., Inc.; D. A. Wallace, Chrysler Corp.; R. G. Williams, The Usona Manufacturing Co., Inc.

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Each machine comes with two different sized screens, ⅛" and ¼", interchangeable in two minutes . . . . and with underneath chute to carry granulated plastic to basket.

Investigate these money-saving machines now. Write for folder and full information.

LEOMINSTER TOOL CO., Inc.
272 Whitney St. Leominster, Mass.
Mfrs. of complete line of equipment for Catalin, Celluloid and Plastic Molding AND EXTRUSION MOLDING DIES.

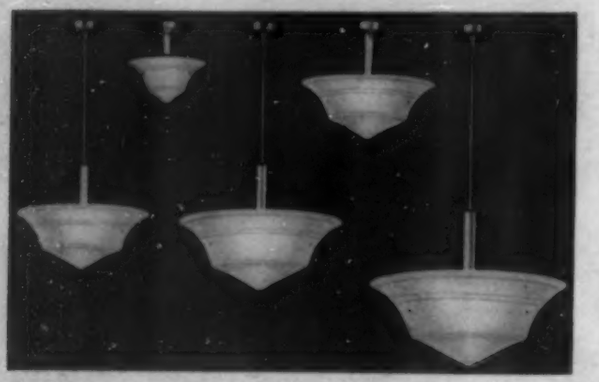
HELIOGEN BLUE B POWDER
WITH COLORLESS PLASTICS PRODUCES BRILLIANT BLUES OF EXCELLENT LIGHT FASTNESS

GENERAL DYESTUFF CORPORATION
435 HUDSON STREET, NEW YORK, N. Y.

News

A NEW PRODUCT CONSISTING OF THIN LAMINATIONS OF wood impregnated with phenolic resins and vulcanized into a hard homogeneous sheet has been developed by The Formica Insulation Company, and is offered for various mechanical and electrical uses. The chief characteristics of the new product are lightness and strength. It is lighter than aluminum, specific gravity 1.35, and has a reported flexural strength of 25,000 to 30,000 lbs. per square inch. Tested parallel to the laminations it is said to stand 60 VPM which establishes it as a fair electrical insulating material.

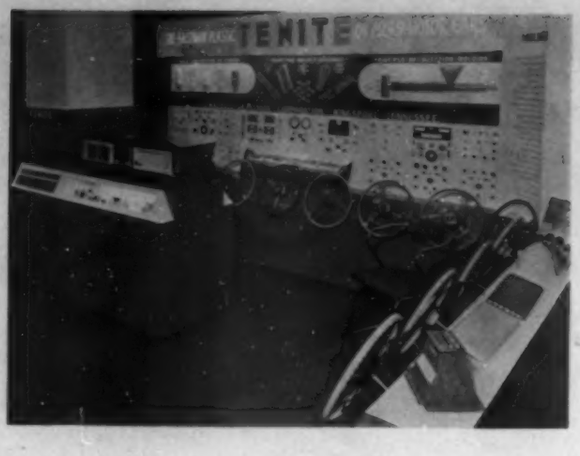
"Pregwood" is highly resistant to moisture absorption and shows a minimum of dimensional change due to moisture and humidity, which adapts it to uses where rigid maintenance of dimensions is required under all sorts of weather conditions. It is probable that this material will find one of its first important applications in airplane propeller blades as it has the requisite strength and is lighter than material now being used for those purposes. It is equally applicable to small machined parts where maintenance of dimensions is a requisite. It has also a low co-efficient of thermal expansion.



LIGHTING FIXTURES WITH TRANSLUCENT UREA REFLECTORS are available from a number of sources for home or office installation. Those pictured are from the Chase Brass & Copper Company's new Midas lines. Urea reflectors insure a uniformity of light diffusion, are lighter in weight and less fragile than opal glass, therefore, they are more satisfactory and lasting where much cleaning or rough handling is encountered. Those illustrated are molded of Beetle by the Bryant Electric Co., excepting the smallest one (inset second from left), which is by the Waterbury Button Co.

A NEW FLUORESCENT LAMPHOLDER FOR USE WITH ONE-inch fluorescent lamps, announced recently by the General Electric Company uses a sheet Textolite cover plate for protection of the wiring and trim construction. Designed for use in showcase lighting, ceiling fixtures, etc., the new unit may be flush mounted by a one-screw assembly method. The lampholder is available in either black or white.

THE COMMERCIAL AVAILABILITY OF A NEW ESTER, DIbutyl sebacate, for use as a chemical plasticizer in nitrocellulose and other plastic compounds, has just been announced by The Resinous Products & Chemical Co., Inc., Philadelphia, Penna. Dibutyl sebacate has properties similar to other commonly used plasticizers such as dibutyl phthalate and tricresyl phosphate. However, it has several outstanding advantages over other materials of this general class, among them the retention of its plasticity at low temperatures. While suitable for a wide range of applications, the properties of dibutyl sebacate are such that it is particularly effective for plasticizing vinyl and acrylic type resins. A four-page leaflet is available.



ATTENTION WAS DRAWN TO PLASTICS AT THE NATIONAL Automobile Show through an interesting exhibit by the Tennessee Eastman Corporation. Tenite dash panels, steering wheels, radio grilles, and scores of small molded parts used on 1939 motor cars, were attractively displayed. The principle of injection molding was illustrated in the exhibit by a simple diagrammatic sketch of a feed hopper, injection cylinder, and mold, accompanied by a group of injection molded castings. This was the only exhibit at the Show to feature plastics exclusively.

CHICAGO MOLDED PRODUCTS CORP. MOVED THEIR OFFICES on November 28, to 1020 North Kolmar Avenue, Chicago, which is the address of their new plant. The new telephone is Capitol 1020.

CHESTER H. GIBBONS, FORMERLY STATIONED AT THE PLANT of Baldwin-Southwark Corporation, Eddystone, Pa., has been transferred to the Ohio district in charge of the sales of products of the Southwark division. Mr. Gibbons succeeds A. Q. Davis, recently appointed shop superintendent of the corporation.

S. LEON KAYE, FORMERLY WITH UNIVERSAL PLASTICS, INC., has become associated with Consolidated Molded Products Corp., Scranton, Pa., as head of materials and research.

WILLIAM ROBERT WILSON, OF DETROIT, REPRESENTING Norton Laboratories, Inc., of Lockport, New York, does not, as reported, represent Paul Norris. While from time to time Mr. Wilson has handled certain matters for Mr. Norris, he informs us that he formed no permanent affiliation.

WE HAVE SINCE LEARNED THAT A TRANSPARENT PLEXIGLAS sheet played a very important part in the development of the new Polaroid glass-inspection polariscope described in a recent issue of this journal. It was desirable to use a transparent protective plate for the 10 in. polarizing field in the polariscope. Due to the temperature variations caused by the light bulbs used as a light source, many transparent substances exhibited internal strains which showed up when the machine was in operation. A large number of materials were tested, but a cast acrylic plastic sheet was the only one which was free from strain originally and over the temperature range, and at the same time had satisfactory stiffness, hardness and freedom from color. This plastic also makes a cover which is shockproof, waterproof, and dustproof. This use of a plastic material illustrates the employment of a property which, unimportant in many applications, is essential for the satisfactory operation of the polariscope.

This polariscope enables the glass industry to conveniently and accurately determine whether glass products are correctly annealed. Strains in glass objects become clearly visible as brilliant colored patterns when specimens are placed between the binocular eyepiece and the polarizing plate.

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Fine Chemicals
for Synthetic Resins and Plastics

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FORMALDEHYDE U. S. P.
Full Strength • Absolute Uniformity

Ash, acidity, color, metal content—all well within the most rigid specifications of the synthetic resin manufacturer.

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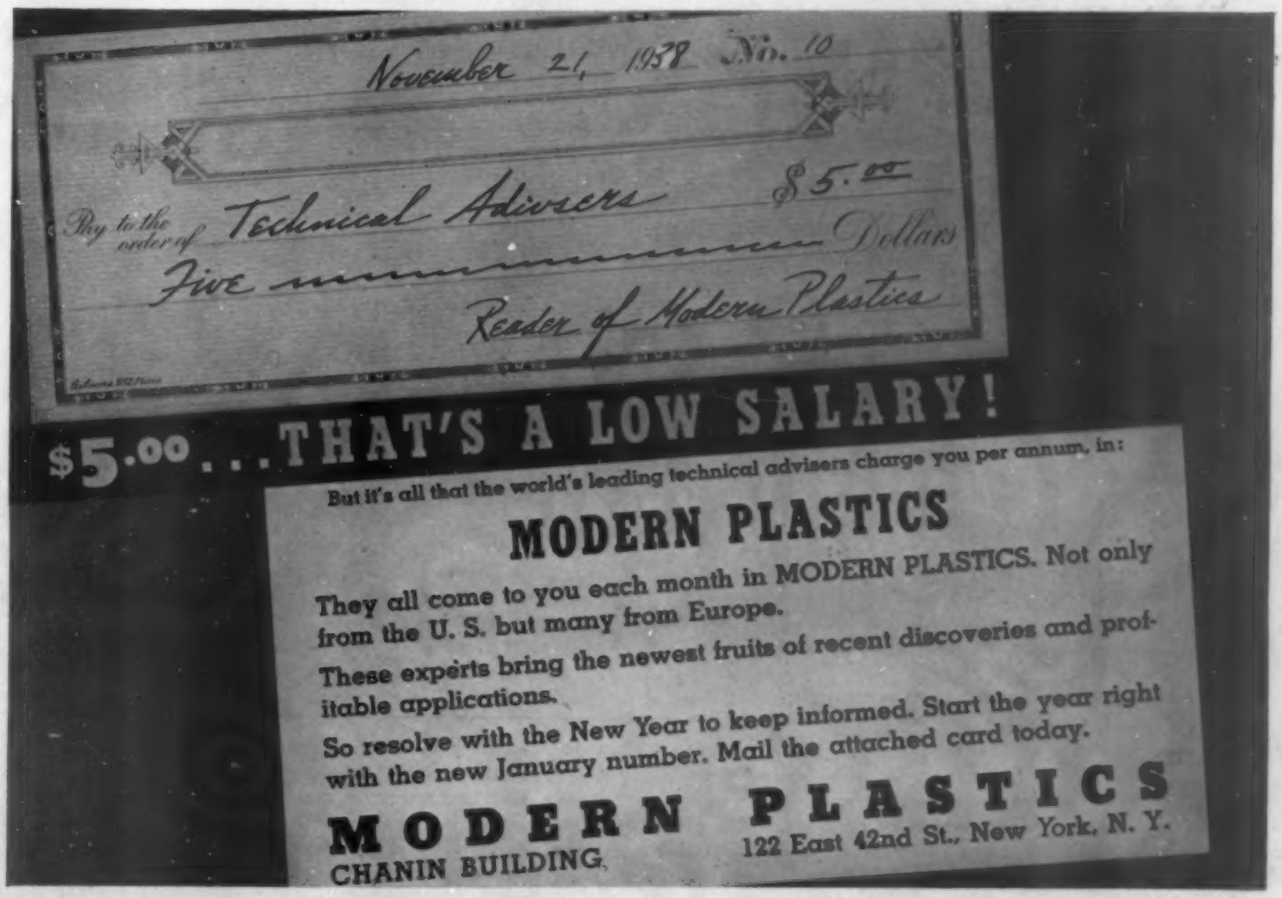
November 21, 1938 No. 10
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Publications

Write for these booklets. Unless otherwise specified, they will be mailed without charge to executives who request them on business stationery. Other books will be sent postpaid at the publisher's advertised prices.

Solvents, 4th Edition

by Thomas H. Durrans

D. Van Nostrand Co., Inc., New York, 1938

Price $5.00 **238 pages**

The advances which have been made since 1933 in the production of solvents and plasticizers and in the elucidation of the scientific principles involved in their use have necessitated this revised edition of a monograph originally published in English and later given meritorious recognition by being translated into German. The first part of the book (71 pages) consists of a series of chapters dealing with the fundamentals in a broad and simple manner. The subjects covered include solvent action, solvent power, plasticizing solvents, solvent balance, viscosity, vapor pressure, flammability, and toxicity. The second part (142 pages) is of a more utilitarian nature and deals with the individual solvents, mainly with the view of facilitating their intelligent use in the lacquer industry. The remainder of the book is comprised of appendices and indexes, listing in particular data on trade names, solubilities of various plastics, and compatibility of various plasticizers with cellulose nitrate and cellulose acetate.

The inclusion in outline form of the latest solvent specifications issued by the British Standards Institution and by the American Society for Testing Materials and the revision and expansion of the chapters on plasticizing solvents and toxicity are especially noteworthy features of the 1938 edition. G. M. K.

The Technology of Solvents

by Otto Jordan, translated by A. D. Whitehead

Chemical Publishing Co. of N. Y., Inc., 1938

Price $10.00 **347 pages**

This is, of course, the author's famous "Chemische Technologie der Losungsmittel," now made available in English and brought up to date by the combined efforts of the author and translator. It covers in detail the chemical origin and properties of the solvents, diluents, and plasticizers used in the preparation of technically useful solutions of rubber, cellulose nitrate and acetate, cellulose ethers, natural and synthetic resins, and bituminous bodies, in other words, solutions of organic plastics. Special consideration is given to the modern conceptions of the relationships between solvent and colloid which lead to miscibility in all proportions and hence to the happy capability of forming continuous films by evaporation.

The book is divided into a General Section (196 pages) and a Special Section (151 pages). The former discusses the classification of solvents, the theoretical aspects of solvent properties and solutions, the use of solvents for extraction purposes and their recovery, the function and properties of plasticizers and plasticizer-binder systems, the physiological action of solvents, the analysis of solvent mixtures, and the manufacture of solvents from various raw materials. The properties of the individual solvents and plasticizers are described and tabulated in the Special Section, followed by comprehensive indexes of trade names, authors and subjects, and supplementary patent references. G. M. K.

A REVISED EDITION OF THE UNIVERSAL TROL-E-DUCT catalog has recently been published by the Bull Dog Electric Products Company, 7610 Campau Ave., Detroit, Michigan. It describes the wiring system designed by the company whereby flexibility and mobility of lighting and power taps may be obtained by movable outlets, which can be pushed back and forth along the wiring ducts. The booklet illustrates the advantages and gives the specifications and assembly methods used in this type of installation.

HOW TO METER STEAM ACCURATELY IN THE FORM OF condensate is the subject of a revised 12 page Bulletin No. 35-80A on the ADSCO Rotary Condensation Meter. It illustrates and describes the meter, gives details of construction, operation, installation diagrams, typical installation photographs and a partial list of users in the industrial, college, institutional and public utility fields.

THE DILECTO CATALOG, A 46-PAGE BOOKLET DESCRIBING the synthetic laminated material made by the Continental-Diamond Fibre Co., East Newark, Del., has just been issued. General descriptions of the various types of the material available and specifications for each grade are given. In addition, suggestions as to methods in the utilization of this laminate are included and a number of typical applications cited.

SELF-CONTAINED, TOGGLE-TYPE STANDARD PRESSES VARYing in size from 20- to 300-tons pressure capacity are described in an illustrated bulletin issued by the F. J. Stokes Machine Co. In the pamphlet a new 200-ton press is announced for the first time. Capable of exerting a hydraulic pressure up to 1100 pounds per sq. in. and taking molds up to 26 by 16 in., the press is powered by a 45 horsepower motor. Specifications of all the Stokes line are tabulated and descriptions of the mechanical principles involved in their construction set forth.

THE REGULAR EDITIONS OF THE *1939 SPRING SILK AND Woolen Cards*, each containing sixty-eight shades, have been issued to members of the Textile Color Card Association, it was announced recently by Margaret Hayden Rorke, managing director. Confidential advance swatches of these colors were previously issued to the membership.

THE QUARTERLY PRICE LIST OF R & H CHEMICALS HAS BEEN published by E. I. du Pont de Nemours and Co., Wilmington, Del., including quotations on a wide range of materials used in the processing and chemical industries.

AN EIGHT-PAGE CIRCULAR ILLUSTRATING THE ROTARY automatic polishing and buffing machine manufactured by the Hammond Machinery Builders, Kalazamoo, Mich., is now available. Adaptable for heavy duty finishing of both plastic and metal parts, the machine is equipped with three polishing or buffing heads. Both the work spindle and magnetic chuck types are described. On the first type, eight revolving spindles are provided and the work to be finished is placed on one of the spindles by the operator, after which it is automatically carried past the polishing or buffing heads.

"NEVILLE RESINS," A 63-PAGE BOOKLET DEALING COMPREhensively with cumaron-indene, modified cumaron-indene and cycloparrafin resins made by the Neville Company, Pittsburgh, Pa., has been issued. Trade designations, physical and chemical properties and shipping rates applicable to the products are included.

THE LAKE ERIE ENGINEERING CORPORATION, BUFFALO, New York, has made available a bulletin describing the applications and economies of hydraulic presses in the metal working industry.

NUMBER ONE ISSUE OF *U. S. CAMERA MAGAZINE* REACHED the stands during the past month and should find a warm welcome by amateurs and professionals alike. It is more than just another picture magazine because subject matter, photography and printing excel any previous attempt and compare favorably with the Annual of the same name which is under the same editorial direction. Furthermore, its efforts are devoted to a better understanding of good photographs and those who make them rather than to news.

Its size, $11\frac{1}{2}$ by $12\frac{1}{4}$ in., though a bit awkward to handle, is interesting to behold and provides an excellent page size for good display. Published quarterly by U. S. Camera Publishing Corp., 381 Fourth Avenue, New York, the annual subscription is $1.75. Editors, according to the masthead, are Edward Steichen, Anton Bruehl, Paul Outerbridge, Willard Morgan, Phillip Andrews and Tom Maloney. Elmer Lasher is art director.

OUR NEW TYPE MACHINES MAKE IMPROVED FLOCKS!

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The result: Cotton flocks now cost less than ever—cotton flocks can now economically replace wood flour or other fillers in many applications.

Place Your Filler Problems Before CLAREMONT

CLAREMONT WASTE MFG. CO.
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THE COUNTRY'S LEADING MAKERS OF COTTON FLOCKS

TRANSPARENT PLASTICS

CONSULT ERIE MOLDING ENGINEERS

Alert manufacturers in different industries are capitalizing on the many production economies and sales advantages of transparent plastics.

Injection molding these materials requires extraordinary care and attention both in the design and in the actual molding of the article. Because Erie Molding Engineers have pioneered much of the transparent plastic injection molding, they are especially suited to handle your requirements. Send us your prints for quotation or design suggestions. There's absolutely no obligation.

Illustration shows 3¾" dial injection-molded of Lucite for Rudolph Wurlitzer Company, North Tonawanda, N. Y.

ERIE RESISTOR CORP.— PLASTICS DIVISION
640 W. 12TH ST., ERIE, PA.

LEAROK
THE BUFFING COMPOUND WITH NO FREE GREASE

The Clean Buffing Compound

LEAROK has no "free grease" in it. It is clean. It doesn't get into crevices and ornamentations. This, coupled with its excellent buffing properties, make it ideal for finishing plastics. LEAROK can be obtained tinted to match the color of the finished article.

Send a sample of your work for our recommendations.

The Lea Mfg. Co.
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Specialists in the Production of Clean-Working Buffing and Polishing Compounds

Plastics are so widely used in relation to other plastic and metal parts that close tolerances for warpage must be maintained. A great help in holding "form" is to be sure of correct molding temperatures by frequent checking of the various cavaties with the Cambridge Mold Pyrometer.

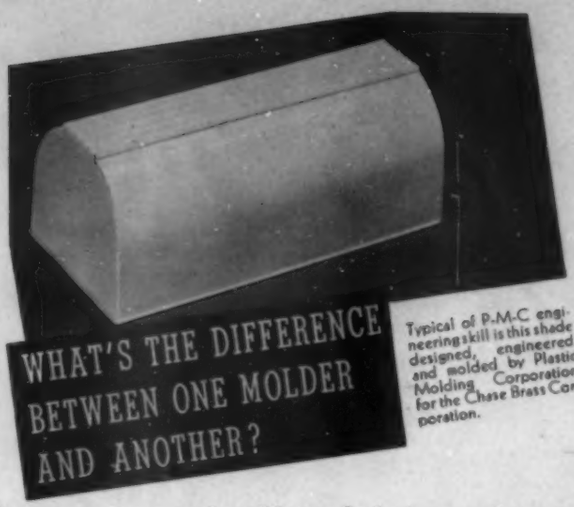
Combination and Single Purpose Instruments

Cambridge Instrument Co., Inc.
3732 Grand Central Terminal
New York City

CAMBRIDGE
Mold, Surface and Needle
PYROMETERS

Bulletin 194—S gives details of these instruments. They help save money and make better plastics.

THIS AUTOMOBILE SHOW NUMBER OF COLLIER'S HAS A COVER WORKED OUT in plastic materials and reproduced through color photography. Automobile parts, ingeniously combined to form the design, were machined from Tenite by Stricker-Brunhuber Corp. under the direction of the artist, C. C. Beall. The tire which serves as a hat is black and white cellulose acetate, metal plated in the center to represent the hub cap and rim. The face is of the same material tinted, with inset lips of brilliant red. The eye is Lucite, hand painted at the back, and the ringlets of hair are copper gaskets soldered together. Eye-lids are metal plated. The collar is a bevel gear—the earring, a miniature gearshift ball of red. The glove is real, but metal plated, as were other parts, by Metaplast Corporation. Versatile things, these plastics, and fascinating.



WHAT'S THE DIFFERENCE BETWEEN ONE MOLDER AND ANOTHER?

Typical of P-M-C engineering skill is this shade designed, engineered and molded by Plastic Molding Corporation for the Chase Brass Corporation.

There are many good molders. And the purchaser of molded parts or products may logically ask whether it makes any difference who does the molding. For your guidance, here are some outstanding facts about the Plastic Molding Corporation.

P.M.C. engineers have 18 years of direct molding experience behind them.

P.M.C. owns a completely integrated plant . . . able to perform every molding and mold-planning operation under a single roof and a single control.

P.M.C. can refer you to half a gross of clients—in almost every line of industry—who have found its prices right, its molding perfect, its inspections rigorous and its promises performed or exceeded.

We invite your further inquiries

PLASTIC MOLDING CORPORATION
SANDY HOOK, CONNECTICUT

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SHEETS—RODS and DISCS

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NATIONAL OUTBOARD HIGH POINT TROPHY
DONATED BY GAR WOOD, JR.
COMPETED FOR UNDER THE RULES AND REGULATIONS OF THE
EMPIRE STATE OUTBOARD DRIVERS RACING ASSOCIATION, INC.

MODERN TROPHIES

THE CHARM AND DIGNITY OF THESE THREE prominent trophies awarded this year depend upon cast resins for the depth of color which contrasts with, and accentuates, the silver and gold bronze employed. The Gar Wood, Jr., National Outboard High Point Trophy is executed in a happy combination of silver and plastic.

The central section is composed of light and dark green cast phenolic in the form of two long, graceful following waves of water upon which glides a perfect scale model of a modern outboard speed boat with a streamline silver figure of Victory urging the driver on to success by holding over his head the traditional wreath of laurel. The trophy, awarded under the regulations of The Empire State Outboard Drivers Racing Association, Inc., is mounted on a silver base 29 in. by 15 in. It is 15 in. high and weighs over fifty pounds.

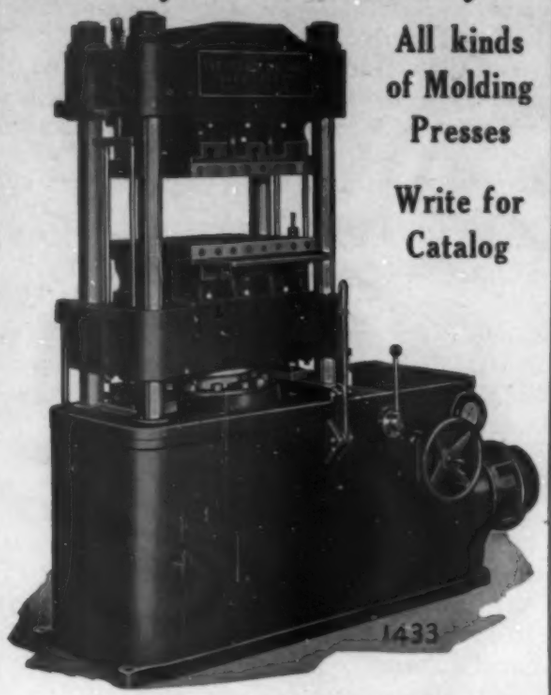
The Jack Dempsey Trophy, awarded for the finest display of sportsmanship on the Empire State Circuit during 1938, is a two-handled covered cup of graceful lines standing $26^1/_2$ in. high on a molded plastic pedestal. The trophy is silver plated and has a sea green cast resin cover supporting a silver model of an outboard speed boat.

The Hudson Mohawk Mutual Casualty Company Trophy below, at the right, is awarded to the driver scoring the highest number of points with one outfit on the Empire State Circuit during 1938. Its circular base, 12 inches in diameter, is of gold bronze and seal brown cast resin. This base supports ribbed bronze pillars which are crowned with a cap of gold bronze and plastic, surmounted by a winged figure of Victory in gold. The total height of the trophy is 28 inches.

Trophy bases of molded plastics have been widely accepted during the past few years and there is every reason for the choice of cast resins with their beautiful translucent colors, to complement the variety of metals used in trophy manufacture.

The Benedict Manufacturing Company created and made these delightful trophies which have spurred outboard motor boat racers to their greatest achievements during 1938. Catalin, the cast resin chosen for their adornment, gives life and color to these awards. The molded base of the Dempsey cup is Bakelite

French Hydraulic Machinery



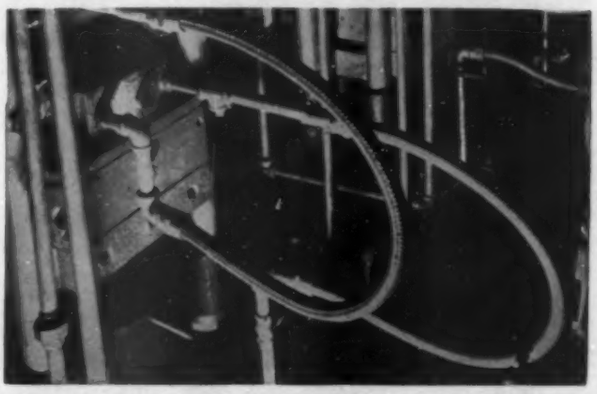
All kinds of Molding Presses

Write for Catalog

Self-Contained Molding Press, Patent Pending

The French Oil Mill Machinery Co.
Piqua, Ohio

REX-WELD flexible metal hose



Developed for platen presses, REX-WELD flexible metal steam connections insure constant tightness under alternate heat and cold. Exclusive one-piece construction—no packing, no leaking, no tightening. Use with Rex-Tite detachable metal-to-metal seat couplings for maximum service at minimum cost. Write for data.

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(Formerly Chicago Tubing & Braiding Co.—Established 1902)
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MACHINES for CELLULOID, CATALIN and other PLASTIC MATERIALS

Bench Saw Tables . Jig Saw Machines . Rod Turning Machines for Beads, etc. . Hand Lever Presses . Gold Inlaying Machines . Electric Steam Heater Tables . Single and Multiple Spindle Drilling Machines . Shaping Machines . Frazing and Engraving Machines

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Dies for Injection Molding

Send for Our New Catalog "F"

STANDARD TOOL CO.
73-75 WATER STREET
LEOMINSTER MASS.

JUST FOR FUN

(*Continued from page 33*) other reason, one of these operators steps over and clears it, pushes the starting button and off it goes again. These machines are run continuously, 24 hours a day. On one part we finished a run of ten days during which time the machine operated continuously for 240 hours without a single interruption from any cause whatsoever.

Degassing shortens time-cycles

Degassing the molds is called for in all operations. In the automatics this is taken care of by the machine itself. With the other presses it is performed by the operator. It is our experience that degassing, usually for two or three seconds, materially shortens the time required for cure and, at the same time, helps produce uniformly high quality moldings. Time-cycles on the standard presses are from three to four minutes, which we are told is quite a bit shorter than is customary on parts of similar size or weight. In automatic molding time-cycles are as little as 70 seconds for smaller parts and up to 115 seconds for the larger control housing shown.

We are particularly pleased with the high quality of the moldings produced by our department, with the great improvement in those assemblies in which moldings are used, and with the many new parts we are making of plastics—parts that would be difficult or impossible to produce economically by other methods. And to say we are pleased with our molding equipment, some of which earned its cost in the first few months of operation, is to put it mildly. We've gone in for plastics, are enthusiastic about them, will doubtless use them in greater and greater quantities.

PLAYTHINGS

(*Continued from page 43*) cores withdrawing from the mold in ten different directions. The mouthpiece, which fits into the zeppelin-shaped tube was also molded at the same time on the injection machine used.

Children of today still like to make a lot of noise and haven't yet lost their yen to play cops-and-robbers. For those who want to be G-men, the John Lauterbach Company is making sirens that sound for all the world like those on a police car. The whistles are molded of phenolic. They are tasteless and since they are of thermosetting material they may be sterilized in boiling water or alcohol. The kids may even arm themselves with plastic revolvers. The Kilgore Manufacturing Co. had added injection molded pearl-like handles to its toy guns, making them resemble the pistols carried by the desperadoes of the old West, yet are as light and harmless as they possibly can be.

Plastics have provided these manufacturers with properties found in no other material by which it is possible to mold all sorts of playthings in gay colors without damage of its pulling and chipping when carelessly handled. The color doesn't come off since there is no applied finish. Instead the toys are color all the way through—are harmless if children decide to chew them instead of use them as they were intended.

Furthermore they have sanitary advantages which permit them to be washed and a smooth hard non-porous surface in which germs find it difficult to hide.

A NEW ADAPTATION OF PLASTICS TO CORROSION-PROOFING

(*Continued from page 49*) lined with the coatings described above. Each one of the pipes was filled with one of the following liquids:

1. 10% concentration of sulphuric acid, 2. 10% concentration of nitric acid, 3. 10% concentration of hydrochloric acid, 4. 10% concentration of hydrofluoric acid, 5. Soap solution, saturated, 6. 10% lye, NaOH, 7. Gasoline, 8. Tomatoes, allowed to ferment and kept wet through the putrefaction stage, 9. 10% tannic acid, 10. Milk, allowed to go through fermentation and putrefaction stage, 11. 10% acetic acid, 12. Kerosene, 13. Ethyl alcohol, 14. Methyl alcohol, 15. Paraffin motor oil, 16. Tap water, 17. Linseed oil, 18. Sea water. At the present time none of these coated tubes shows any evidence whatsoever of attack by the corrosive agents contained therein.

Coated pipes were installed in various Southern California outfall and septic sewers, where the destructive agents present are hydrogen sulphide, sulphuric acid, sea water, and its consequent hydrochloric acid. Tests for the dielectrical qualities of these films conducted by the California Institute of Technology and by the laboratories of the Los Angeles Bureau of Power and Water show an extremely high resistance to puncture and a break-down voltage lying between 500 and 700 volts per mil of thickness.

Plasticity to impact was determined in the laboratory as opposed to brittleness by dropping various weighted objects on coatings applied to steel. In all cases dents resulted with no shattering or loosening of the coating from the steel by impact.

Abrasion and erosion resistance were found by test in the laboratory of the Los Angeles Bureau of Power and Water to be comparable with that offered by mild steel and cement concrete. Tenacity of adhesion to underlying surfaces was tested by the physical laboratory of Raymond Osborn, Los Angeles, and reported at 325 lbs. per square inch of surface. The accompanying illustrations show several methods of testing these coatings and demonstrate the method of application.

The commercial products having passed through the experimental stage are now being utilized by several large petroleum producers, refiners and handlers; pipe companies and municipal sewer departments; breweries, wineries and food processors. Again the use of modern plastics points the way to counteract the corrosion of structural materials in the heavy duty field.

Complete Line of
Machinery for Celluloid
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Leak-Proof Dependability
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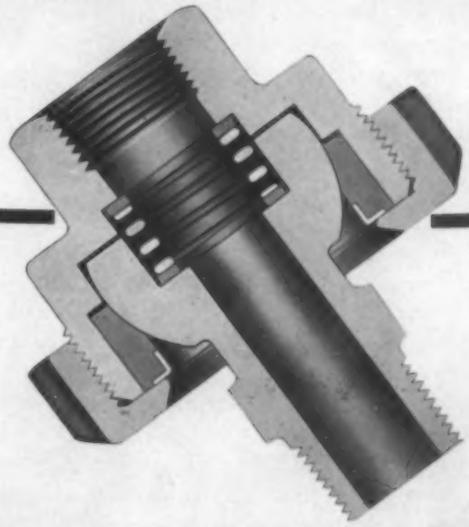

● Don't take chances on expensive shutdowns and production delays. Where pipe movement is involved, depend on BARCO joints to solve your problem.

BARCO "SWIVEL" JOINTS

BARCO MANUFACTURING COMPANY
1813 Winnemac Ave. Chicago, Ill.

GOOD-BYE TO GLARE

(*Continued from page 28*) the section directly under the burned-out lamp, and at the same time prevented rusting and corrosion and made cleaning far easier. Rattling of the louvres is made impossible by a permanently tight threaded assembly method.

Further adding to the soft, even light distribution are laminated translucent urea panels running along the inside of the troughs, and molded urea pier lights placed between the windows. Thus the entire illumination of the car is reflected or transmitted through urea plastics in either molded or laminated form, and The Adams & Westlake Company sums it up by saying: "We are indebted to the modern plastic materials which played such an important part in developing this attractive and efficient lighting fixture."

Because molded urea plastics offer great weight savings over other materials, a non-fragile and therefore safer type of reflector and better illumination properties, this versatile material will undoubtedly continue to replace older materials in railroad cars, busses, trolleys and airplanes. And, this new subway fixture will help tremendously in showing lighting engineers in the transit field that illumination need not always mean a cover over a lamp, and that plastics can be adapted to a wide variation of forms to meet every kind of construction needs.

FIFTY MILLION PASSENGERS CAN'T GO WRONG

(*Continued from page 27*) the two-cavity small mold. The valve then is thrown over to cut off the steam and apply water for the cooling cycle, which is six minutes for the large mold and three and one-half minutes for the two-cavity small mold. Covers are then ejected from the molds by use of high pressure. This difference in the molding cycle of the two presses is due to the heating elements that enter into the mold construction.

Construction of the mold is somewhat different from the ordinary compression mold design. Since it is impossible to strip the parts with the knockout pins on any part of the cover, it is necessary to incorporate the stripper-plate designed mold. Specifications and tolerances on the dimensions for the thickness of wall, the overall height, width, etc., are held very closely, making it necessary to equip the press with a dial indicator which shows when the mold is closed. Electric timers are set for each phase of the molding cycles and, in addition, a light acts as an indicator calling for a change in operation for each step.

Cellulose acetate permits manufacture without waste of a single scrap of material. Flashings can be reworked and imperfect moldings can be run through for future moldings. In either event the finished product has quality identical with cases made from cellulose acetate molding powder that has been previously unused.

The railway signal system over the San Francisco–Oakland Bridge will be completely controlled by automatic devices. That is how engineers have been able to design a system, involving three railway companies and a maze of tracks, to send 10-car passenger trains rushing out across the bridge between Oakland and San Francisco at 65-second intervals. Since trains must leave on the second, in daylight or darkness, in brilliant weather or blinding fog, this modern railway system will remove signal lights from poles along the track and place them squarely in front of the motorman inside the cab. He merely looks at the panel in front of him for information on proper train speed.

To further eliminate the possibility of human error audible signals are employed to warn the motorman if he permits his train to exceed a safe speed and to notify him when it becomes necessary to reduce speed. Failure to properly observe these signals will result in power being shut off, the brakes being applied automatically, and the train being brought to a gentle stop.

POWER FACTOR MEASUREMENTS

(*Continued from page 52*) removed. It may be seen that the coils can be readily changed in both the oscillator, and the measuring circuit. The mounting of the 224A tube of the vacuum tube voltmeter is so arranged that a very short lead provides connection to the electrode stand. The rear tube of the oscillator is not wired into the circuit, but is provided only to expedite repairs, if needed. It may be noted that since the installation of the apparatus in 1935, no repairs have been necessary to either unit.

The extended range of the oscillator (i.e., to 25.0 megacycles) above the 1.5 megacycle limit of the measuring equipment is used in conjunction with a special ultra-high frequency apparatus for tests which will be described in a further paper. A view of some of the coils is given by Fig. 5. The six small diameter coils in the foreground are for use in the measuring circuit, whereas, the other inductors provide the continuous frequency range of the oscillator.

Conclusion

Apparatus for routine tests of power factor and dielectric constant of solid electrical insulating materials has been developed. The normal frequency range for tests is from 100 kilocycles to 1.5 megacycles (1.0×10^5 to 1.5×10^6 cycles) may be extended to 25.0 megacycles by use of a special ultra-high frequency measuring circuit.

It is believed that this apparatus embodies many advantages over the "breadboard type" which is still used by quite a few engaged in the testing of insulation. Careful shielding, and the use of a vacuum tube voltmeter ensures both freedom from coupling errors and minimum drain on the oscillator output. It has been found possible to repeat measurements to within two percent of initially measured values.

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Let us show you how . . . and how much . . . you can benefit by using this system.

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KEENE, NEW HAMPSHIRE

1

2

1. Hang it up; lay it flat; stand it upright on a table. It's all the same to the Thin Man radio. Every side but one on this unique instrument is up. Cabinets, molded by the Reynolds Spring Co. are available in black and ivory Bakelite

2. Mix-Pix, olive stabbers in bright colors, hang on the side of a glass and identify your's up to the third round of drinks; after that it makes no difference anyway. They're injection molded of Tenite by the Cruver Manufacturing Company

3

4

3. The Parrot speed fastener is designed to withstand the constant hammering that office staplers must take in service. The color of the Tenite base and head brighten up any desk on which it is used. Molding was by the American Insulator Corp.

4. Three plastic materials are combined in this new aid to fisherman's luck, the Wright Uni-matic reel. The light weight barrel is of Durez, provided with a small Tenite window, removable for inspection of the reel. Knobs are of Plaskon. All plastic parts were molded by the Remler Co., Ltd.

IN REVIEW

5. Laminated phenolic ledger covers such as these won't buckle or warp under heat and humidity. Public Utilities in Central and South America are adopting them because of this unusual wearability. Bakelite laminated is used by the Federbrush Co. in making these covers

6. A flashlight is combined with a magnifying glass in this new device by E. W. Pike & Company. Bakelite, molded by Boonton Molding Co. forms the bezel attaching the glass to the metal flashlight barrel

7. Supreme Olive Oil Corp. caps its unusual bottles with a phenolic cap sealed with cellulose. Neither the Bakelite closure nor the seal will affect the oil in any way

8. The Dazey Ice crusher has a lower cup of molded urea which fits into the working part with a slight twist. Designed by Barnes & Reinecke and molded by Imperial Molded Products Company

Manufacturers' addresses will be sent if you will write to the Editor, enclosing 3-cent stamp for reply

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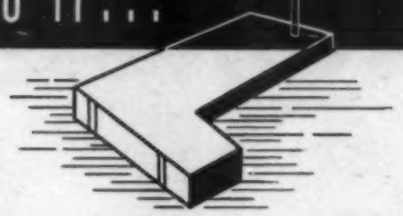

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Branch Offices or Distributors in Principal Cities

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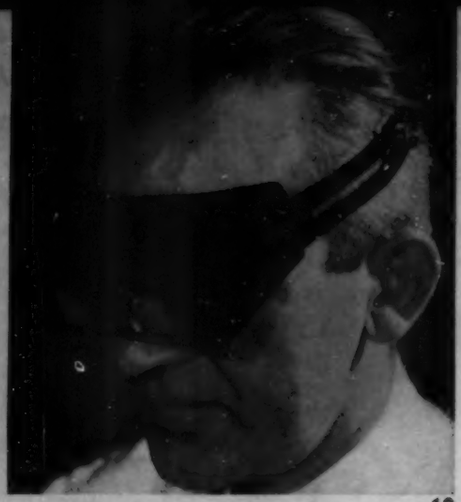

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9. Cook-Rite Utensils Distributing Co. is marketing these aluminum pots and pans with unusual safety features. Handles and knobs, molded of special heat-resisting Bakelite by Kurz-Kasch, Inc., are ventilated to make them cooler. The contents of the utensils may be inspected, or water drained off without removing the lid

10. For working conditions that require visual magnification with both the worker's hands free, Carl Zeiss has designed this head magnifier. The unit which holds the magnifying lenses fits over the eye. It is molded of black phenolic by Mr. Zeiss, and is equipped with an adjustable head strap

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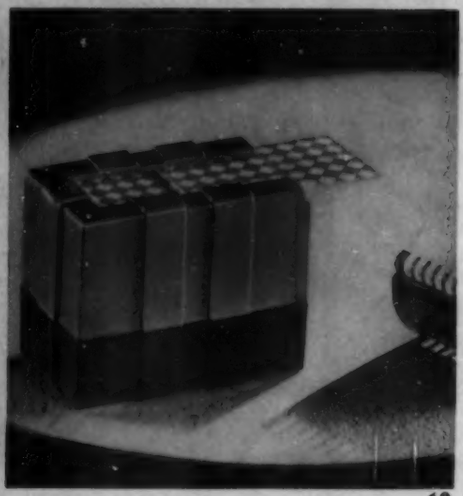

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11. Displays of wrist watches take on new attractiveness with this combination stand and box. When the upper velvet-lined half is closed the box presents a rounded streamlined appearance. Both parts are injection molded of Tenite by the Elmer E. Mills Corporation for Sears Roebuck & Company

12. The Lionel Razor Blade Corporation has brought out this compact container for new and old razor blades to hold twenty-five double-edged blades. Turn it upside down and you have a hone. Molded of two-tone Bakelite by the Accurate Molding Corp.

IN REVIEW

13. Cast Monsanto phenolic was used by the Ivorycraft Co. to fashion these wallpaper rollers for the Hyde Manufacturing Co. The waterproof, easily cleaned and smooth surface of this material assures long service with little pitting or wear

14. The Conrad Handy-Knife uses a replaceable razor blade for its cutting edge. The handle of black phenolic guards both the blade and the user

15. Long pieces of Lumarith cast to the shape of the cross-section are sliced and buffed to make these Jewel picture and mirror hangers. The Emeloid Co. is turning out these novel items in bright transparent colors

16. These Mattatuck bowling pins, molded of Tenite by the Waterbury Button Co., are designed to withstand frequent knocks and bumps without chipping or splitting. A metal insert fits setting-up pins and adds weight

Manufacturers' addresses will be sent if you will write to the Editor, enclosing 3-cent stamp for reply

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